U. S. Government RESEARCH REPORTS

October 5, 1961
Vol. 36, No. 7

THE UNIVERSITY OF MICHIGAN
OCT 16 1961
CHEMISTRY LIBRARY

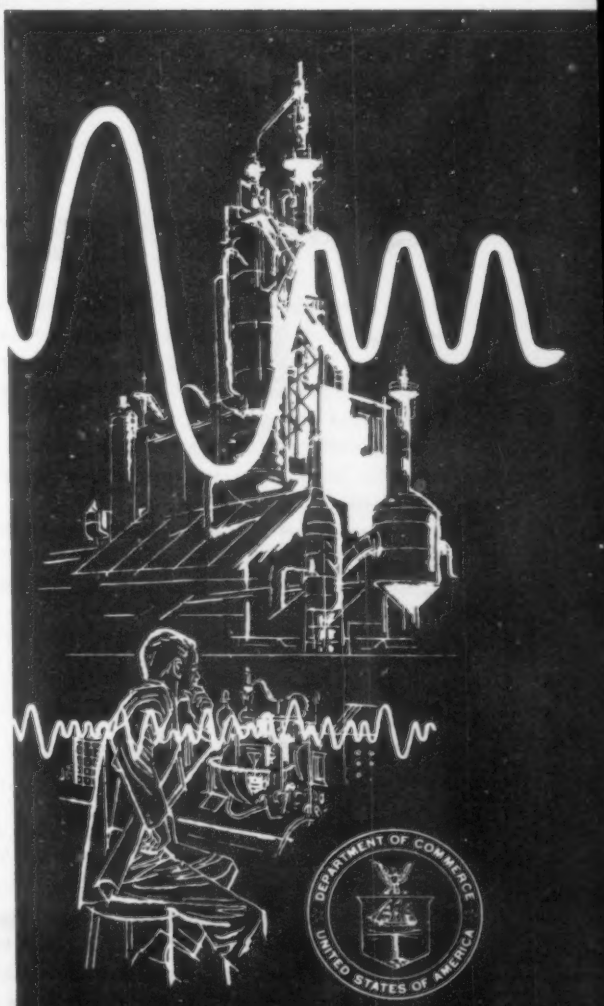
. . . available to science and industry . . .

Chemistry
Z
7913
.U58

The reports listed in this publication, unless otherwise noted, are available from the Office of Technical Services, U.S. Department of Commerce, at the prices indicated. They may also be ordered through Department of Commerce Field Offices.

The Office of Technical Services collects and distributes the research and development reports of the Army, Navy, Air Force, Atomic Energy Commission, and other agencies of the Federal Government for the use of private scientific and industrial firms and organizations in the development of new products and processes and in making technological improvements.

This publication is issued twice a month to announce new material available through the Office of Technical Services, which sells copies of Government reports at the cost of reproduction and handling. For additional information and ordering instructions, see inside of front cover.



U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Thomas E. Drumm, Jr., *Administrator*

Office of Technical Services
John C. Green, *Director*

Issued twice a month. Annual subscription $15 ($3.75 additional for foreign mailing). Single copy $1. Make remittance payable to Superintendent of Documents and mail either to a U.S. Department of Commerce Field Office or to Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Address changes should be sent to Superintendent of Documents.

Contents may be reprinted freely. Mention of source will be appreciated.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

U.S. Government Research Reports

This publication is issued twice a month to announce new reports of research and development released by the Army, Navy, Air Force, Atomic Energy Commission, and other agencies of the Federal Government. Unless otherwise indicated, reports listed are available from the Office of Technical Services. Some are reproduced by photo-offset printing, others by photocopy reproduction.

The first section of *U.S. Government Research Reports* is compiled by the Armed Services Technical Information Agency and is called "Technical Abstract Bulletin." (ASTIA is a Department of Defense agency which services DOD agencies and their contractors with military research information.) The next section is called "Non-Military and Older Military Research Reports." Here are listed new reports of the Atomic Energy Commission, the Office of Saline Water of the Department of Interior, and reports of other civilian agencies of the Government. In addition, this section lists military research reports not to be found in the "TAB." Most of these older military reports have been acquired by OTS in response to specific industry requests.

How To Order Reports

Almost all reports listed in *U.S. Government Research Reports* are available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C., or may be ordered through any Department of Commerce Field Office. Prices are given with each entry. Please use the identification numbers (AD number, PB number, AEC series number) and titles of reports when ordering. Prepayment is required. When any report is not available from OTS but from another source, the name and address of that source will be given. Direct your order to that address and not to OTS.

MICROFILM—Any reports available from the Office of Technical Services will be provided in microfilm (35 mm.) on request. The following prices are charged for microfilm: 1 through 20 pages, 80 cents minimum; and 3 cents per page for every page in excess of 20 pages.

CONTENTS

Div.		Page
	INTRODUCTION	ii
1	AIRCRAFT AND FLIGHT EQUIPMENT	1
2	ASTRONOMY, GEOPHYSICS, AND GEOGRAPHY	5
3	CHEMICAL WARFARE EQUIPMENT AND MATERIALS	9
4	CHEMISTRY	9
5	COMMUNICATIONS	12
6	DETECTION	15
7	ELECTRICAL EQUIPMENT	17
8	ELECTRONICS AND ELECTRONIC EQUIPMENT	23
9	FLUID MECHANICS	42
10	FUELS AND COMBUSTION	48
11	GROUND TRANSPORTATION EQUIPMENT	50
12	GUIDED MISSILES	51
13	INSTALLATIONS AND CONSTRUCTION	54
14	MATERIALS (NON-METALLIC)	55
15	MATHEMATICS	61
16	MEDICAL SCIENCES	67
17	METALLURGY	72
18	MILITARY SCIENCES AND OPERATIONS	77
19	NAVIGATION	78
20	NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY	79
21	NUCLEAR PROPULSION	80
22	ORDNANCE	80
23	PERSONNEL AND TRAINING	82
24	PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES	84
25	PHYSICS	86
26	PRODUCTION AND MANAGEMENT	101
27	PROPULSION SYSTEMS	105
28	PSYCHOLOGY AND HUMAN ENGINEERING	108
29	QUARTERMASTER EQUIPMENT AND SUPPLIES	111
30	RESEARCH AND RESEARCH EQUIPMENT	111
31	SHIPS AND MARINE EQUIPMENT	120
32	MISCELLANEOUS ARTS AND SCIENCES	121
33	TRANSPORTATION	121
	AD INDEX	I-1

CONTENTS (CON.)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

	Page
BIBLIOGRAPHY	S-1
ASTRONOMY	S-1
BEHAVIORAL SCIENCES	S-1
BIOLOGICAL SCIENCES	S-2
CHEMISTRY	S-4
EARTH SCIENCES	S-8
ENGINEERING	S-9
MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT	S-19
MATERIALS	S-20
MATHEMATICS	S-23
MECHANICS	S-26
METALLURGY	S-28
NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY	S-30
PHYSICS	S-36
RESEARCH METHODS, TECHNIQUES AND EQUIPMENT	S-42
SOCIAL SCIENCES	S-42
NUMBER INDEX	S-47

TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-260 033 Div. 1
(24 July 61) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SHELF AND SERVICE LIFE TEST OF CARTRIDGE, FIRE EXTINGUISHER VALVE, P/N 931182,
by John R. Parrish. June 61, 13p. incl. illus. table (Rept. no. OOY TR 61-31)
Unclassified report

DESCRIPTORS: *Fire extinguishers, Valves, Reliability, Storage, Aircraft equipment, Tests, Failure (Mechanics).

This project was initiated to verify and/or extend the 10-year shelf and service life, and to determine environmental and functionability aspects of the Fire Extinguisher Valve cartridge when installed in aircraft. Thirty cartridges of the latest manufacture available (1957) and 36 cartridges of various ages (1952 to 1957) were used as a control lot to obtain empirical data. Two hundred and ninety-six cartridges manufactured in 1950 and 1951 were environmental conditioned and tested for shelf life. Fifty cartridges which had previously been installed in aircraft were further conditioned and tested for serviceability. As a result of the test it is recommended that the shelf life remain at 10 years. Cartridges installed in aircraft should be inspected at each 100-hour inspection and replaced after 500 aircraft flying hours. (Author)

AD-260 100 Div. 1, 12
(25 July 61) OTS price $16.50

Dayton U. Research Inst., Ohio.
DESIGN OPTIMIZATION PROCEDURES AND EXPERIMENTAL PROGRAM FOR BOX BEAM STRUCTURES. VOLUME II. Final rept.,
by Laszlo Berke and Paul L. Vergamini. June 60, 244p. incl. illus. tables.
(Contract AF 33(616)6426)
(WADD TR 60-149, vol. 2) Unclassified report

DESCRIPTORS: *Box beams, Design, Production, Manufacturing methods, Bonding, Brazing, Riveted joints, Tests, Test equipment, Test methods, *Sandwich construction, Honeycomb cores, Aluminum alloys, Titanium alloys, Stainless steel, Deflection, Temperature, Measurement, Instrumentation, Stresses, *Airframes.

The second volume of the final report contains the detailed fabrication procedures which involve bonding, brazing and riveting operations, description of the instrumentation system of the test specimens, and a production evaluation of the box beam structures in terms of facilities required, cost, and ease of manufacture. In addition, a description of the test equipment, test procedures, and discussion and presentation of all of the test data are given. The box beams were tested at both ambient and steady-state or transient elevated temperature conditions. The test instrumentation included strain gages, thermocouples, and deflection gages. Stability and ultimate strength behavior of the test specimens was highly influenced by manufacturing tolerances, web to cover attachment problems, and other deviations from the assumed monolithic structure with exact geometry of its components. (Author)

AD-260 227 Div. 1, 22
(27 July 61) OTS price $3.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF THRUSTER, CARTRIDGE ACTUATED, T22,
by S. J. Kent. Feb 61, 33p. incl. illus. tables.
(Rept. no. R-1538)
(Proj. 1362)
(WADD TR 60-453) Unclassified report

DESCRIPTORS: *Jettisonable cockpits, *Explosive actuators, *Cartridges, Design, Tests, Roll, Ejection, Jet planes, Stabilization, *Fins, Propelling charges, Release mechanisms, Jet fighters.

Efforts were expended to provide a thruster to operate a mechanism which would position the dorsal fins on the F-103 aircraft escape capsule during ejection. The dorsal fins were needed to overcome the capsule's rolling tendency. This thruster was designated as thruster, cartridge actuated, T22. Several test models and prototype T22 thrusters were fabricated and successfully fired. The data obtained from the test firings indicated that the performance characteristics of the thruster were reproducible over the entire operating temperature range of the unit. (Author)

AD-260 228 Div. 1, 2
(24 July 61) OTS price $7.60

Air Force Cambridge Research Labs., Bedford, Mass.
EVALUATION OF AN ARCTIC ICE-FREE LAND SITE AND RESULTS OF C-130 AIRCRAFT TEST LANDINGS. POLARIS PROMONTORY, NORTH GREENLAND 1958-1959,
by Stanley M. Needleman, Donald W. Klick, and Carlton E. Molineux. Mar 61, 70p. incl. illus. tables. 20 refs. (Air Force Surveys in Geophysics no. 132; AFCRL-252)
(Proj. 7628)
Unclassified report

DESCRIPTORS: *Landing fields, *Greenland, *Arctic regions, Airplane landings, Geology, Meteorology, Geography, Transport planes, Military aircraft, Soils, Terrain, Tests, Aerial photography.

Field investigations of an ice-free land area at Polaris Promontory, Hall Land in northwest Greenland were undertaken to determine if this area

could support austere military aircraft operations. Detailed scientific observations of the geology, meteorology, and natural terrain features of the area were made, thorough investigations of the soil features and bearing strength were conducted, and an airstrip was prepared and marked. Successful test landings by a C-130 aircraft were made on the airstrip. Possible alternate airstrip sites were studied and conclusions drawn on the usability of such ice-free land sites for military activities. The selection of specific sites in such areas by low-altitude aerial reconnaissance and applied photogeologic interpretation methods is feasible and practical. Such techniques, when employed by professionals with considerable field experience in the Arctic regions, are reliable, rapid, and inexpensive. (Author)

AD-260 354 Div. 1
(31 July 61) OTS price $1.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF CAPABILITY AND UTILITY OF FLIGHT PROGRESS STRIP LOADER.
Final rept.,
by Robert Stein, Robert Delaney and others.
Oct 60, 14p. incl. illus.
Unclassified report

DESCRIPTORS: Aircraft equipment, *Loaders, Design, Effectiveness, Lift, Analysis.

The evaluation tests that were conducted on the flight progress strip loader that was built under Contract FAA/BRD-113 were described. The flight progress strip loader was developed to automate the processes of separating and loading machine-printed flight progress strips into strip holders. Original engineering specifications, requiring the loading of 60 flight progress strips per minute, were modified to permit a reduced specification of 44 per minute. The report of the inspection and acceptance trip to Merz Engineering, Inc., indicates that a letter was prepared by the Federal Aviation Agency approving the change in the specifications. Results of the testing of the flight progress strip loader indicated a need for a redesign and incorporating several modifications. The results also indicate that it would be undesirable to install the prototype model of the flight progress strip loader in an operational facility without incorporating the modifications. (Author)

AD-260 530 Div. 1
(3 Aug 61) OTS price $2.60

Electro-Mechanics Co., Austin, Tex.
BALLOON HANDLING TECHNIQUE.
Interim rept. no. 1,
by Fred J. Morris. 1 Nov 59, 18p. incl. illus.
(Contract AF 30(602)1884, Proj. 4540)
Unclassified report

DESCRIPTORS: *Balloons, Handling.

This report is concerned with a description of tethered balloon handling technique for use in the operation of the sphere technique for obtaining three-dimensional radiation patterns from ground radars. (Author)

AD-260 546 Div. 1, 29
(2 Aug 61) OTS price $2.60

Marine Corps Equipment Board, Quantico, Va.
ONE MAN ROTORCYCLE.
Final rept.
25 July 61, 30p. incl. illus.
(Proj. 52-58-03)
Unclassified report

DESCRIPTORS: *Marine Corps, *Naval equipment, Aircraft equipment, Vertiole take-off planes, *Training, Operation, *Helicopters.

AD-260 638 Div. 1, 18
(4 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF EFFECTS OF INTERCEPTOR ROLL PERFORMANCE AND MANEUVERABILITY ON SUCCESS OF COLLISION-COURSE ATTACKS,
by William H. Phillips. Aug 61, 37p. incl. illus. tables (Technical note no. D-952; Supersedes NACA Research Memorandum L58E27, AD-221 520)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-952.

DESCRIPTORS: *Interception, Aircraft intercept control systems, *Fighters, Aircraft, *Jet fighters, Flight paths, *Roll, Aerial warfare, Air force operations, Combat, Rockets, Launching.

The relative effects of performance and normal-acceleration capability in collision-course attacks are analyzed. A graphical method for visualizing attack situations is presented. Brief analyses are also made of the effects of interceptor speed and radar range on the success of attacks. (Author)

AD-260 639 Div. 1
(3 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
REPEATABILITY, DRIFT, AND AFTEREFFECT OF THREE TYPES OF AIRCRAFT ALTIMETERS,
by William Gracey and Richard E. Stell. July 61, 40p. incl. illus. tables (Technical note no. D-922)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-922.

DESCRIPTORS: *Altimeters, Sensitivity, Military operations, Simulation, Flight testing, Errors, Effectiveness, Flight instruments, Radio altimeters, Test equipment.

In a series of laboratory tests of a number of sensitive altimeters (Air Force type C-12 and C-13) and of precision altimeters (Air Force type MA-1), the repeatability was determined for the full range of each type of instrument, the drift characteristics were determined during 1-hour periods at various altitudes, and the drift and aftereffect were measured for a variety of simulated flights representative of some civil and military operations. For comparable altitude ranges, the repeatability errors of the C-12 and C-13 types were generally of the same order while those of the MA-1 type were

somewhat smaller. The drift and aftereffect of the C-12 instruments were smaller than those of the C-13 instruments, and the drift and aftereffect of the MA-1 altimeters were considerably smaller than those of both types of the sensitive instruments. The drift of each of the three types of altimeters was found to increase with altitude and the drift of the precision type was found to increase with increasing rate of altitude change preceding the drift test. (Author)

AD-260 663 Div. 1, 22
(3 Aug 61) OTS price $4.60

Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT AND QUALIFICATION OF THRUSTER, CARTRIDGE ACTUATED, XM13,
by C. S. Sterrett and L. R. Triscoli. May 61, 45p. incl. illus. tables (FA rept. no. R-1542) (Sponsored by Wright Air Development Div., Wright-Patterson Air Force Base, Ohio)
(WADD TR 61-164) Unclassified report

DESCRIPTORS: *Explosive actuators, Tests, *Aircraft canopies, Design, Cartridges, Aviation safety, Instrumentation, Test methods, Jet fighters, Release mechanisms.

A cartridge-actuated device was developed to unlock the canopy as part of the emergency escape system of the F-104A and C series aircraft. An existing device, the T25 thruster, was first tested against the load condition in the F-104A and found to be marginal. It was subsequently modified to provide greater thrust, and the modified thruster was designated Thruster, Cartridge Actuated, XM13. The XM13 thruster was developed further to provide sufficient thrust to unlock the canopy in the F-104B and D series aircraft. The results of the qualification test program showed that thrust and pressure measurements satisfied the requirements of the Air Force work statement. (Author)

AD-260 678 Div. 1, 26
(4 Aug 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT CONSTRUCTION TECHNOLOGY,
by V. P. Grigor'ev. 23 June 61, 306p. incl. illus. tables (Trans. no. MCL-792, pt. 1)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Airplanes, *Production, *Manufacturing methods, Quality control, Textbooks, Industrial production, Costs, Industrial equipment, Aircraft industry, Design, Education, Conveyors, Standardization, Templates, Gages, Airplane panels, Cutting tools, Construction, Machining, Costs, Milling machines.

This book which includes parts 2, 3, and 4 catalogued as AD-260 682, AD-260 679 and AD-260 681, clarifies the main problems of the course, Aircraft Construction Technology, being studied in the aircraft institutes. The bases of aircraft production are presented which include: (1) the planning of technological processes; (2) the typical technological processes of manufacturing parts from sheets, profiles, drop forgings, and castings; and (3) the process of assembling units, sections, assemblies and the aircraft as a whole. A step-by-step discussion presents the basic concepts and features of aircraft construction, the setting up of technological processes depending upon the scales of production, and the methods and means of increasing labor productivity and reducing production costs. Considerable attention is diverted to examining the methods and means of assuring parts interchangeability, to problems of quality control, to principles of developing typical and operating technological processes of manufacturing parts and the assembly of products, as well as to methods of planning the technical equipment on the basis of standardized parts and elements. (Author)

AD-260 679 Div. 1, 26
(4 Aug 61) OTS price $18.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT CONSTRUCTION TECHNOLOGY,
by V. P. Grigor'ev. 23 June 61, 296p. incl. illus. tables (Trans. no. MCL-792, pt. 3)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Airplanes, *Production, *Manufacturing methods, Industrial production, Textbooks, Aircraft industry, Education, Installation, Joints, Airplane panels, Airframes, Welding, Arc welding, Riveted joints, Adhesives, Welded joints, Riveting hammers, Rivets, Costs, Quality control, Metal joints, Construction.

Contents:
Assembly and installation operations
- Basic concepts and definitions
- Methods of assembling and assembly bases
- Technological processes of assembling units and panels
- General characteristics of the joints in aircraft construction
- Assembly of units and panels of welded construction
- Assembly of units in panels with the aid of welding
- Assembly of units, panels and sections with the aid of glued joints
- Technological characteristics of units and panels

AD-260 681 Div. 1, 26
(4 Aug 61) OTS price $17.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT CONSTRUCTION TECHNOLOGY,
by V. P. Grigor'ev. 23 June 61, 280p. incl. illus. tables, 37 refs. (Trans. no. MCL-792, pt. 4)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Airplanes, *Production, *Manufacturing methods, Industrial production, Textbooks, Aircraft industry, Education, Airplane panels, Flight testing, Jigs, Quality control, Design, Errors, Materials, Effectiveness, Construction, Helicopters, Templates.

Contents:
Assembly and installation operations
- Assembly of sections
- Assembly of subassemblies
- Over-all assembly of aircraft
- Assembly jigs

Technological preparation of production
- Content and volume of operations in the preparation of production
- Technological methods of assuring quality of production in aircraft construction
- Technological improvement of aircraft design

AD-260 682 Div. 1, 26
(4 Aug 61) OTS price $15.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT CONSTRUCTION TECHNOLOGY,
by V. P. Grigor'ev. 23 June 61, 222p. incl. illus. tables (Trans. no. HCL-792, pt. 2)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Airplanes, *Production, *Manufacturing methods, Quality control, Textbooks, Industrial production, Aircraft industry, Education, Design, Industrial equipment, Castings, Machining, Automation, Coatings, Pickling, Casting, Plating, Construction.

Contents:
Technological process of manufacturing aircraft parts
Manufacture of parts from sheets, profiles and tubes of various materials
Mechanical working of parts from stampings, castings and rolling
Etching (Pickling) and anode-mechanical processing of metals
Protective coatings and methods of applying them to parts
Mechanization and automation of technological processes of manufacturing parts

AD-260 706 Div. 1, 9
(7 Aug 61) OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
AERODYNAMICS OF CONES AND PROTUBERANCES. AN ANNOTATED BIBLIOGRAPHY,
Comp. by Alfred A. Beltran. May 61, 40p. 74 refs. (Special bibliography no. SB-61-28)
Unclassified report

DESCRIPTORS: *Bibliography, *Conical bodies, *Aerodynamics, Theory, Pressure, Distribution, Mach number, Heat transfer, Turbulent boundary layer, Turbulent flow.

This annotated bibliography is concerned with experimental and theoretical pressure distribution at Mach 4 and above on sharp-nose cones, hemispherically-blunted cones, and elliptical cones. Effect of protuberances on heat transfer in turbulent boundary layer is also covered. (Author)

AD-260 738 Div. 1, 27
(2 Aug 61) OTS price $4.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
FIRE-HAZARD STUDIES ON THE LOCKHEED F-104A POWERPLANT.
Final rept.,
by Marvin F. Rasmelsburg and Eldon B. Nicholas, Aug 60. 50p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Jet fighters, Jet planes, *Turbojet engines, *Aviation safety, *Hazards, Hydraulic fluids, Lubricants, Jet engine fuels, Ignition, Afterburners, *Fire detectors, Effectiveness, Tests, Exhaust nozzles, Mechanical drives, Fires, Temperature, Power plants, Test equipment.

A test program on the F-104A powerplant installation was conducted to determine inherent fire-hazards and fire-safety characteristics under various simulated aircraft operating conditions. The tests showed that ignition of the flammable fluids (JP-4 jet fuel, MIL-L-7808 engine lube oil, and MIL-O-5606 hydraulic fluid) was obtained from hot surfaces at idle power setting and after engine shutdown but was not obtained at power settings above idle. Spark ignition of JP-4 fuel was accomplished in the secondary airstream at airflows up to 42 pounds per second. Flammable fluids released in the secondary airstream ignited during the the transition from military to maximum afterburning. The fire detector system, originally located in the aft fuselage did not detect fires resulting from hydraulic fluid leaks in the afterburner nozzle actuator system. Therefore, basic requirements for relocating a fire detector system in the aft fuselage were determined. (Author)

AD-260 759 Div. 1
(7 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
GROUND AND IN-FLIGHT ACOUSTIC AND PERFORMANCE CHARACTERISTICS OF JET-AIRCRAFT EXHAUST NOISE SUPPRESSORS,
by Willard D. Coles, John A. Mihaloew, and William H. Swann. Aug 61, 50p. incl. illus. (NASA TN-D-874)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-874.

DESCRIPTORS: *Jet engine noise, Countermeasures, Exhaust nozzles, Turbojet exhaust nozzles, Flight testing.

Characteristics were determined for a twin-engine jet aircraft with the following configurations: (1) eight-lobe exhaust noise suppressors, (2) eight-lobe nozzles and ejectors, and (3) the unmodified aircraft. In-flight sound pressure levels measured on the ground under the flight path were reduced 5 to 6 decibels by the suppressors. Similar reductions in perceived noise level occurred. Increases in total drag coefficient of 3 and 7 percent and decreases in specific range of 5 to 14 percent were found to result from the suppressor configurations. (Author)

AD-260 798 Div. 1, 22
(8 Aug 61) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SHELF AND SERVICE LIFE TEST ON PRIMACORD CHARGE ASSEMBLY.
Airmunitions test rept.,
by James L. Higgins. July 61, 27p. incl. illus. (Rept. no. OOY-TR-61-32)
Unclassified report

DESCRIPTORS: *Detonating cord, Tests, Test methods, Jet bombers, Elevators, *Release mechanisms, Storage, Effectiveness, Detonation, Life expectancy, Ejection seats, Jettisonable equipment, Bombers, Jet planes, Sensitivity, Temperature, Humidity.

The primacord charge assembly is designed to sever the elevator control rod on B-57A & RB-57 aircraft prior to seat ejection. The primacord charge assembly presently has a one year service life and a four year combined shelf and service life. Tests were conducted to determine if the

shelf and service life of the primacord charge assembly could be extended beyond four years. The primacord charge assemblies were subjected to high and low temperatures; high humidity; sensitivity, impact and function tests. All assemblies functioned satisfactorily. As a result of these tests, it is recommended that the service life be extended to two years, and the combined shelf and service life extended to six years. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-260 020 Div. 2
(24 July 61) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
SOME RESULTS OF EXPERIMENTS WITH AN INTEGRATED, WET, DIABATIC WEATHER PREDICTION MODEL,
by Jerome Spar, Joseph P. Gerrity, Jr., and Lester A. Cohen. June 61, 28p. incl. illus.
(Scientific rept. no. 2)
(Contract Nonr-28509)
Unclassified report

DESCRIPTORS: *Atmosphere models, *Air mass analysis, Weather forecasting, Cyclones, Programming, Sources, Meteorological data, Numerical analysis, Oceanographical data, Errors.

Two series of predictions made with the weather prediction model described in (AD-240 577) are presented and analyzed. Twelve hour forecasts based on the barotropic model and on three different versions of the baroclinic model are compared. The effects of baroclinicity, heat flux from the sea, and latent heat of condensation on the predictions are examined. Systematic errors apparently due to inconsistent truncation in the vertical vorticity advection and tipping terms are found to be serious. (Author)

AD-260 177 Div. 2, 25
(26 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
ON THE ELECTRON DENSITY DISTRIBUTION ABOVE THE F2 PEAK,
by S. J. Bauer. July 61, 6p. incl. illus.
(Technical note no. D-1065)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-1065.

DESCRIPTORS: *Ionosphere, Atmosphere sounding, *Electrons, *Upper atmosphere, Density, Temperature, Ions, Oxygen, Protons.

The distribution of free electrons in an isothermal upper ionosphere consisting of a binary ion mixture (O(+) and H(+)) is discussed. It is shown that for diffusive equilibrium, which should prevail at altitudes well above the F2 peak, measurements of the electron density distribution permit the determination of other structural parameters of the upper atmosphere, such as the temperature and the concentration of oxygen ions and protons. (Author)

AD-260 180 Div. 2
(26 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
DENSITY IN A PLANETARY EXOSPHERE,
by Jackson Herring and Herbert L. Kyle. July 61, 5p. incl. illus. (Technical note no. D-1042)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA technical note D-1042.

DESCRIPTORS: *Exosphere, *Density, Planetary atmospheres, Particles, Distribution, Velocity, Integration.

A discussion of the Opik-Singer theory (Phys. of fluids 2:653-655, Nov-Dec, 1959) of the density of a planetary exosphere is presented. Their density formula permits the calculation of the depth of the exosphere. Since the correctness of their derivation of the basic formula for the density distribution has been questioned, an alternate method based directly on Liouville's theorem is given. It is concluded that the Opik-Singer formula seems valid for the ballistic component of the exosphere; but for a complete description of the planetary exosphere, the ionized and bound-orbit components must also be included. (Author)

AD-260 182 Div. 2
(26 July 61) OTS price $2.50

National Aeronautics and Space Administration, Washington, D. C.
MONTHLY AND ANNUAL WIND DISTRIBUTION AS A FUNCTION OF ALTITUDE FOR PATRICK AIR FORCE BASE, CAPE CANAVERAL, FLORIDA,
by J. W. Smith and W. W. Vaughan. July 61, 118p. incl. tables (Technical note no. D-610)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-610.

DESCRIPTORS: *Wind, Periodical variations, Florida, Distribution, Statistical data, Tables, Velocity, Measurement, Radiosondes.

This analysis presents the statistical wind distribution at Patrick Air Force Base, Cape Canaveral, Florida (Atlantic Missile Range) in tabular form as a function of altitude for monthly and annual periods. Data are tabulated at 1-km intervals up to 32 km altitude. It summarizes the data available, and up-dates earlier studies with the aim of providing the latest possible statistical representation of the wind distributions. While uncertainties still exist in some details of the wind distribution, this is the most reliable information, to represent the larger scale wind flow characteristics. (Author)

AD-260 219 Div. 2, 24, 8
(27 July 61) OTS price $2.60

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE LIMITING DETECTIVITY OF OPTICAL AMPLIFYING EQUIPMENT.
Rept. on Research on the Quantum Nature of Light, by R. K. H. Gebel and Lee Devol, Apr 61, 23p. incl. illus. 28 refs. (ARL-17, Supersedes WADC TN 59-405, AD-239 553)
Unclassified report

Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

DESCRIPTORS: *Stars, Optical images, Astronomical cameras, *Astronomy, Sky brightness, Light, *Amplifiers, *Image converter tubes, *Image intensifiers (Electronics), Brightness, *Television display systems, Image tubes, *Photographic recording systems, Equations, Detection, *Optical systems, *Planets.

The limits in the ability to produce photographic recordings for visual detection of very faint celestial bodies in the presence of the sky background by using conventional photography and by employing optical amplification with contrast enhancement and high capacity storage target plates are investigated and compared. Equations are given which show the effects of the different variables involved for 3 types of imaging systems: (1) the conventional photographic system, (2) the image converter, and (3) the closed circuit television type of optical amplifier. The 3rd system was found superior to the 2 other systems. (Author)

AD-260 237 Div. 2, 25
(27 July 61) OTS price $1.10

Naval Research Lab., Washington, D. C.
ON THE METHOD OF MEASURING THE SPECTRUM OF PARTICLE DISTRIBUTION IN CLOUDS AND FOGS (O metode izmereniya spektra raspredeleniya chastits v oblakakh i tumanakh),
by A. E. Mikirov, tr. by A. Pingell. 1960, 5p. incl. illus. (NRL Trans. no. 791 from Mezhvedomstvennaya Konferentsiya po Voprosam Issledovaniya Oblakov, Osadkov i Grozovogo Elektrichestva, pp. 197-199, 1957)
Unclassified report

DESCRIPTORS: *Clouds, *Fog, Particles, Distribution, Measurement, *Aerosols, Optical systems, Microphotography, Photoelectric cells, USSR, Technological intelligence.

The most widely used method for measuring the size of particles in clouds and fogs is microphotography, but this method is too laborious and cumbersome. The possibility of developing the photoelectric methods for measuring the size of particles of liquid aerosols with a diameter of 2 microns and larger is demonstrated. The principle of the proposed photoelectric method for measurement of the spectrum of particle distribution in clouds and fogs consists in the use of a darkened field method. (Author)

AD-260 271 Div. 2, 6
(28 July 61) OTS price $1.60

Canterbury U. (New Zealand).
THE LATITUDE DEPENDENCE OF RADAR METEOR SHOWER OBSERVATIONS,
by C. S. L. Keay and C. Ellyett. 12 May 61, 17p.
(Scientific rept. 3)
(Contract AF 64(500)-6)
(AFCRL-372) Unclassified report

DESCRIPTORS: *Meteors, Detection, Radar analysis, *Radar echo areas, Abundance, *Atmosphere entry, Measurement, Statistical analysis, Tables, Northern hemisphere, Southern hemisphere.

A simplified method of assessing the relative significance of meteor showers is discussed. The bias inherent in single-station rate measurements is largely eliminated and the importance of short-range echoes is emphasized. Comparison of results obtained from both hemispheres reveals a considerable measure of agreement between various surveys. (Author)

AD-260 280 Div. 2, 8, 30
(28 July 61) OTS price $7.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A STUDY OF HYDROMAGNETIC EMISSIONS,
by Lee R. Tepley. 14 Apr 61, 78p. incl. illus. 20 refs. (Rept. no. LMSD-894814)
(Contract AF 19(604)5906)
(AFCRL-198) Unclassified report

DESCRIPTORS: Geophysics, Magnetic fields, Wave transmission, Test facilities, Instrumentation, Scientific research, *Terrestrial magnetism, Oscillation, Antennas, Ionosphere, Measurement, Magnetic storms, Solar flares, Design, Magnetic recording systems, *Magnetohydrodynamics, Gas ionization.

Considerable geomagnetic micropulsation data were collected; however, attention is focused on the collection, reduction, analysis and interpretation of a single useful data sample obtained during a 4-day period, 18-21 November. To facilitate the interpretation of these data, consideration was given to observations in the same frequency range by other workers. The agreement between experiment and theory is consistent with the hypothesis that the signals of interest are generated above the ionosphere and are propagated downward through the ionosphere by hydromagnetic waves. Of particular interest is the long duration (up to 5 hours) of some hm emissions, and the simultaneous occurrence of many emissions in groups of the same slope (time rate of change of frequency). Consideration is given to the relationship between the occurrence of the signals and other geophysical effects observed during the unusual period of solar and geomagnetic activity. A positive correlation is established between the occurrence of the signals and polarcap absorption. Finally, a possible analogy is drawn between hm emissions and VLF emissions as observed by other workers, and a model is presented which may lead to understanding of generation of hm emissions. (Author)

AD-260 295 Div. 2
(28 July 61) OTS price $1.10

Navy Electronics Lab., San Diego, Calif.
A SUN POSITION DIAGRAM FOR PT. BARROW, ALASKA.
Research and Development rept. for Nov 60- Feb 61,
by D. E. Brown. 19 Apr 61, 2p. incl. illus.
(NEL rept. no. 1041)
Unclassified report

DESCRIPTORS: *Sun, Position findings, *Diurnal variations, Azimuth, Alaska, Nomographs.

A diagram was developed which gives continuously, all sun positions for Point Barrow, Alaska (71 deg 26 min n,) above, near, and below the horizon for Local Civil Time. No calculations are required. Instructions for use are included on the diagram. (Author)

AD-260 408 Div. 2
(31 July 61) OTS price $7.60

2nd Weather Wing, Air Force.
TECHNICAL BULLETIN.
9 May 61, 74p. incl. illus. 50 refs.
Unclassified report

DESCRIPTORS: *Meteorology, *Storms, Thunderclouds, Great Britain, Hail, Gusts, *Weather forecasting, Mediterranean Sea, Numerical methods and procedures.

Contents:
Thunderstorms in Great Britain
Severe weather associated with thunderstorms
Forecasting strong winds at Sculthorpe, England
Horizontal weather depiction nephanalysis
An operation evaluation of some joint numerical weather prediction unit products
Mediterranean meteorology

AD-260 431 Div. 2
(1 Aug 61) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 14 for June 61.
30 June 61, 36p. incl. illus, table (AID rept. no. 61-95)
Unclassified report

DESCRIPTORS: *Upper atmosphere, Ionosphere, Solar energy, Van Allen radiation belt, Cosmic rays, Terrestrial magnetism, Atmospheric electricity, Literature, USSR, Electrons, Density, Satellite vehicles.

Materials are reported on the following topics: (1) Ionospheric electron concentration, (2) Solar radiation and the ionosphere, (3) Van Allen belts and cosmic rays, (4) Telluric currents, (5) Atmospheric electricity, and (6) Satellite and missile data. (Author)

AD-260 460 Div. 2
(1 Aug 61) OTS price $1.10

Indiana U., Bloomington.
ANALYSIS OF STELLAR MOTIONS.
Summary rept. through 30 June 61,
by Frank K. Edmondson, 30 June 61. 2p.
(Contract Nonr-282100, Proj. NR 046-769)
Unclassified report

DESCRIPTORS: *Stars, Motion, *Velocity, Measurement, Data storage systems, Punched card methods, Astronomy, Research program administration.

This report includes:
RADIAL VELOCITIES OF 11th MAGNITUDE A AND K STARS, by F. K. Edmundson.

AD-260 472 Div. 2
(1 Aug 61) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
FORECAST STUDY FOR MYRTLE BEACH AIR FORCE BASE. FOG STUDY.
Rev. 10 June 61, 6p. illus.
Unclassified report

DESCRIPTORS: *Weather forecasting, *Fog, Air force operations, Wind, Surface temperatures, Sea breeze, Meteorological data, South Carolina.

AD-260 477 Div. 2
(1 Aug 61) OTS price $9.60

Air Weather Service, Washington, D. C.
TERMINAL FORECASTING MANUAL FOR DETACHMENT 2, 8th WEATHER SQUADRON, HOMESTEAD AIR FORCE BASE, FLORIDA 1956.
15 May 61, 119p. incl. illus.
Unclassified report

DESCRIPTORS: *Weather forecasting, Meteorology, *Handbooks, Meteorological charts, Tables, Florida.

AD-260 480 Div. 2
(31 July 61) OTS price $1.60

Texas A. and M. Coll., College Station.
IMPROVEMENT, EVALUATION, AND EXTENSION OF CAPABILITIES OF METEOROLOGICAL SIMULATION (DALLAS TOWER PROGRAM).
Quarterly rept. no. 4, 16 Mar-15 June 61,
by William H. Clayton. 15 June 61, 17p.
(Contract DA 36-039-sc-84942)
Unclassified report

DESCRIPTORS: *Weather forecasting, *Meteorological instruments, Meteorological data, Simulation, Weather stations, Instrumentation, Analog computers, Texas, Research program administration.

Further investigation as to the necessity and desirability for converting the network at Cedar Hill to collection on a remote basis has been performed and the opinion offered during the previous quarter that this should be done at the earliest possible time remains valid. The wet bulb system at the main station still poses a problem with regard to remote operation inasmuch as a reliable sensor for humidity determination has yet to be found. A report on an aluminum-aluminum oxide sensor, developed by the Sandia Corporation, has been received and additional inquiries are being made as to the suitability of these sensors for use in the collection program. (Author)

AD-260 554 Div. 2
(14 Aug 61) OTS price $1.60

Kaysam Corp. of America, Paterson, N. J.
DESIGN, DEVELOPMENT AND PRODUCTION OF METEOROLLOGICAL BALLOON, CAPABLE OF ASCENTS TO ALTITUDES IN EXCESS OF 120,000 FEET DURING THE DAY AND AT NIGHT.
Final rept. 29 Apr 60-15 July 61,
by Eric Nelson. 15 July 61, 13p. incl. tables.
(Contract DA 36-039-sc-84926)
Unclassified report

DESCRIPTORS: *Meteorological balloons, Design, Tests, High altitude, Flight testing, Rate of climb indicators, Reliability.

A dual-purpose balloon capable of reaching altitudes of 120,000 ft 60% of the time and altitudes of 110,000 ft 80% of the time was successfully developed. The balloon performs equally well by day and by night. This balloon weighs in the order of 1800 grams and requires a total lift of not more than 4950 grams, which is 1000 grams less lift than the maximum specified. It may be concluded, that the requirements were successfully accomplished. (Author)

AD-260 571 Div. 2, 30
(3 Aug 61) OTS price $3.60

Oregon State Coll., Corvallis.
INVESTIGATION OF INSTRUMENTATION AND TECHNIQUES FOR ARMY WEATHER OBSERVATION.
Quarterly technical rept. no. 7, 1 Nov 60-31 Jan 61,
by Fred W. Decker, Herbert Kershaw, Jr., and others. 31 Jan 61, 30p. incl. illus. tables.
(Contract DA 36-039-sc-78918, Proj. 3A99-07-001-07)
Unclassified report

DESCRIPTORS: *Weather forecasting, Meteorological radar, *Radar echo areas, Instrumentation, Meteorological data, Precipitation,

Meteorological instruments, *Army operations, Military requirements, Classification, Weather stations.

Appearing in this report is a summary of the radar film record obtained from the PPI scope of Weather Radar Set AN/CPS-9 operated at McCulloch Peak, Oregon, for the period 1 November 1960 through 31 January 1961. Echo types appearing in the different zones and during various synoptic conditions are summarized. The results of a study attempting to evaluate the precipitation rate at a certain location by relating the amount of intervening echo to the presence of or lack of an echo at the target location show that certain nominal rates of precipitation are required to produce an echo for varying amounts of intervening echo. (Author)

AD-260 578 Div. 2, 8
(3 Aug 61) OTS price $1.10

Florida U. Engineering and Industrial Experiment Station, Gainesville.
STUDIES OF SPORADIC RADIOFREQUENCY EMISSION FROM THE PLANETS.
Final rept.,
by Alex G. Smith, T. D. Carr, and others. 1961, 9p. 44 refs.
(Contract DA 01-009-ORD-655)
(AROD rept. no. 2083.11)
Unclassified report

DESCRIPTORS: *Planets, *Jupiter, *Electromagnetic waves, Radiofrequency, High frequency, Polarization, Sources, Solar flares, Radio interference, Solar disturbances, *Solar spectrum, Propagation, Saturn, Venus, Mars.

Studies of the gross spectrum of the Jupiter radiation now extend all the way from 5 to 31 mc. Indications are that the frequency of occurrence peaks quite sharply near 18 mc and falls off rapidly towards higher frequencies. There is someindication of a secondary maximum in the low-frequency region, perhaps near 10 mc. There is also a strong suggestion that the over-all frequency of occurrence of the radiation is inversely correlated with sunspot number. Dynamic spectra obtained with the swept-frequency receiver show that individual pulses of Jupiter radiation (which normally last from 0.2 to 2 secs.) have bandwidths ranging from about 0.3 to 2 mc. There is also strong evidence that many of these bursts show a fine structure, resembling harmonics spaced from 0.1 to 0.5 mc apart. (Author)

AD-260 601 Div. 2, 8
(3 Aug 61) OTS price $11.50

High Altitude Observatory, Boulder, Colo.
STUDIES OF FAST-DRIFT RADIO BURSTS AND RELATED PHENOMENA.
Doctoral thesis,
by J. M. Malville. June 61, 155p. incl. illus. tables, 141 refs. (Scientific rept. no. 6)
(Contract AF 19(604)3872)
(AFCRL-385) Unclassified report

DESCRIPTORS: *Solar flares, Solar disturbances, Solar corona, Solar noise, Exosphere, *Radio waves, *Radio astronomy, Plasma physics, Radiofrequency, Interferometers, Electrostatics, Mathematical analysis, Spectrographic analysis, Radio interference, Solar atmosphere, Terrestrial magnetism, Aurorae.

The characteristics of fast-drift bursts are reviewed. It is noted that the observed increase of burst duration toward lower frequencies is consistent with collisional damping of electron oscillations. The average duration of bursts at 25 mc indicates a negative temperature gradient in the corona above the 100 mc level. The results of past studies of the association between flares and fast-drift bursts are summarized. The importance of using standardized flare patrol data is emphasized. Observational evidence for solar corpuscular emission is reviewed. Complex disk surges are defined and their usefulness for probing the small scale structure of solar magnetic fields is noted. A discussion is given of possible sources of plasma instabilities in the corona, and the theory of the instability of interacting beams is developed. A possible test for the suggested high energy density of type III burst-streams is proposed in connection with bursts of bremsstrahlung radiation observed in the auroral zone. (Author)

AD-260 723 Div. 2
(8 Aug 61) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PRECISE MEASUREMENT OF ATMOSPHERIC TEMPERATURE DIFFERENCES.
by Albert R. Tebo. May 61, 22p. incl. illus. tables (ASRDL Technical rept. no. 2207)
(Proj. 3D36-04-001-02)
Unclassified report

DESCRIPTORS: *Thermistors, *Atmosphere, *Temperature, Measurement, Reliability, Electric bridges, Tests, Recording devices.

Design of a circuit is given for the continuous measurement of temperature differences up to 10 C over the temperature range -40 to +40 C. Bead thermistors are used as sensors in an off-balance Wheatstone bridge. The output is linearized by means of another thermistor in the input circuit. Compensation for change in temperature level is accomplished by means of a variable resistance in the input circuit, controlled by a bimetal at the basic ambient temperature. Using a 6V dc source, the full-scale output for a temperature difference of 10 C is ten millivolts, which may be fed into a null-balance-type recorder. No switching is necessary over the whole range except when the temperature-difference reverses polarity, in which case switching can be accomplished in the recorder circuit. Accuracy of the linearized and compensated circuit is better than + or - 0.1 C. (Author)

AD-260 727 Div. 2, 12
(8 Aug 61) OTS price $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AEROBEE NB3.104 (NRL-71).
Meteorological data rept.,
by Gordon L. Dunaway. July 61, 32p. incl. tables.
Unclassified report

DESCRIPTORS: *Sounding rockets, Meteorology, Wind, Computers, Temperature, Pressure, Atmosphere, Humidity, Rocket trajectories, *Terminal ballistics, Tables, Meteorological data.

Aerobee NB3.104 (NRL-71) was launched by Naval Ordnance Missile Test Facility personnel, White Sands Missile Range, New Mexico. Meteorological data used in conjunction with theoretical calculations to predict rocket impact are presented. Wind data for the first 2,000 feet above the surface were obtained from a Double-Theodolite Wind Velocity Computer System. Temperature, pressure, and humidity data, along with upper wind data from 2,000 to approximately 100,000 feet above the surface, were obtained from standard rawinsonde operations. Mean wind component values in each ballistic zone were determined from vertical cross sections by the equal-area method. (Author)

AD-260 755 Div. 2, 25
(7 Aug 61) OTS price $2.75

National Aeronautics and Space Administration, Washington, D. C.
VARIATIONS OF COSMIC RAY INTENSITY,
ed. by Yu. G. Shafer. Aug 61, 128p. incl. illus. tables, 157 refs. (Technical trans. no. F-67 of the Issue 3, Physics Series, of Transactions of the Yakutsk Branch of the Siberian Division of the Academy of Sciences of the SSSR, 1960)
Unclassified report

Also available from NASA, Wash. 25, D.C., as NASA technical trans. no. F-67.

DESCRIPTORS: *Cosmic rays, *Radiation counters, *Meteorology, Ionosphere, *Atmospheric sounding, Interstellar matter, USSR, Technological intelligence, Theory, Intensity, Mathematical analysis, Magnetic storms.

Contents:
Experimental apparatus and methods
Part played by meteorological factors in variations in different cosmic ray components
Extra-atmospheric variations in cosmic rays and certain theoretical problems

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-260 216 Div. 3
(27 July 61) OTS price $3.60

Aircraft Armaments, Inc., Cockeysville, Md.
E41R1 POINT SOURCE GAS ALARM,
Engineering progress rept. 29 Apr-10 June 61, by Edward B. Tyler. 13 July 61, 37p. incl. illus. tables (Rept. no. ER-2431)
(Contract DA 18-108-cml-6553)
Unclassified report

DESCRIPTORS: *Toxic agent alarms, Materials, Design, Effectiveness, Reliability, Production, Maintenance, *Human engineering, Manufacturing methods, Chemical warfare agents, Gas detectors.

Experimental and original-design air pump tests were performed. Studies were continued on low-voltage cut-off circuits and the 18-volt regulator. The up-dating of Phase I electronics was continued, including a modification to permit installation of the vacuum sensor switch in Phase I models. Tests were continued on new materials for the fluid pump. Alarm case materials were investigated for both Isofoam swelling and Fiberglass growth. Modifications were made to facilitate transportation. Fluid pot assembly and tape-drum retraction snubber redesign were completed. Major redesign of the tape transport system and photometer head was undertaken.

AD-260 740 Div. 3
(8 Aug 61) OTS price $6.60

General Mills, Inc., Minneapolis, Minn.
FUNDAMENTAL STUDIES OF THE DISPERSIBILITY OF POWDERED MATERIALS,
Quarterly progress rept. no. 4, 3 Mar-3 June 61, by J. H. Nash, G. G. Leiter and H. W. Zeller. 30 June 61, 54p. incl. illus. tables (Rept. no. 2184)
(Contract DA 18-108-405-cml-824)
Unclassified report

DESCRIPTORS: *Aerosols, Powders, Particles, Organic compounds, Saccharides, Scattering, Tensile properties, Adhesion, Adsorption, Additives, Shear stresses, Electrostatics, Sulfimides, Glycols, Ethylenes, Polymers, Stearates, Fluid flow, Tests.

A technique involving the use of a 2-in.-diam fluid energy mill was devised for blending and deagglomerating powders. A study of average bulk density as a function of plug length and compressive load was made on each of the 3 base powders (saccharin, Span 60, and Carbowax 6000). The effect of removal of adsorbed gases and vapors was investigated by disk-lifting tests on samples of the 3 base powders under normal laboratory conditions and under high vacuum conditions (0.00002 mm Hg). A technique involving stratified layers was devised for the purpose of studying powder displacement during disk-lifting tests. An improved technique for measuring shear strength of powders is described. Aerosol decay tests were made on samples of the same powders on which shear strength measurements were made. A comparison of results indicates that there is little correlation. A theoretical sstudy was made to determine energy expended in dispersing an aerosol. Electrostatic charge analyses were made on aerosols of Span 60 and Carbowax 6000. (Author)

4. CHEMISTRY

AD-260 047 Div. 4, 30
(24 July 61) OTS price $1.10

Pennsalt Chemicals Corp., Philadelphia, Pa.
CALCULATION OF THERMOGRAVIMETRIC DATA BY ELECTRONIC DIGITAL COMPUTER,
by J. H. Soulen. July 61, 7p. incl. illus. tables (Technical rept. no. 21)
(Contract Nonr-268700)
Unclassified report

DESCRIPTORS: *Gravimetric analysis, Voltage, *Programming, *Reaction kinetics, Temperature, Decomposition, *Calcium compounds, *Carbonates, Chemical reactions, Measurement, Digital computers, High temperature research, Electronics.

A method has been developed for automatic computation of temperature, weight, weight loss, and rate of weight loss from raw electromotive force data representing these quantities in thermogravimetry. (Author)

AD-260 120 Div. 4, 7, 14
(25 July 61) OTS price $3.60

Speer Carbon Co., Niagara Falls, N. Y.
DEVELOPMENT OF ELECTRODE MATERIALS FOR FUEL CELLS.
Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by W. E. Parker, F. Rusinko, Jr., and R. W. Marek. June 59, 31p. incl. illus. tables (Rept. no. SCC-10)
(Contract DA 36-039-sc-85356)
Unclassified report

DESCRIPTORS: *Fuel cells, *Electrodes, Materials, Preparation, Electrochemistry, Power supplies, Physical properties, Carbon, Fruits, Graphite, Processing, Moistureproofing, Porosity, Gas diffusion, Surface area.

Investigation of the use of various raw materials for electrode preparation continued. A filler made from coconut shells has shown considerable promise; samples had permeabilities greater than 1 darcy. Activated carbons are also being tested. A study of the effect of process variables on the physical properties of carbons has been intensified. Extension of the testing of these effects to fuel cell operation will be made as time permits. A concentrated effort on the improvement of wetproofing behavior of electrode materials is being pursued. Early results have appeared promising. (Author)

AD-260 161 Div. 4, 25
(26 July 61) OTS price $1.60

Boston U., Mass.
THE REACTIONS OF NITROGEN ATOMS WITH ORGANIC COMPOUNDS.
Final rept.,
by Norman N. Lichtin. 7 Apr 61, 16p.
(Contracts AF 19(604)5695 and AF 19(604)7272)
(AFCRL-622) Unclassified report

DESCRIPTORS: Atoms, *Nitrogen, *Organic compounds, Chemical reactions, Gases, *Radiochemistry, Electromagnetic waves, Light, Photometers, Hydrocarbons, *Labeled substances.

The reactions were studied of atomic nitrogen with simple organic compounds labeled with 14C with the objective of elucidating chemical reaction mechanism. Relatively crude measurements were made of the intensity and rough wavelength distribution of light emitted during reactions of nitrogen atoms with a variety of organic substances. Apparatus and basic procedures for determination of the identities and molecular radioactivities of gaseous products of reaction of atomic nitrogen with 14C-labeled propylene were set up and preliminary work with unlabeled propylene begun. During this period, the intensity of light emission from the reactions of several substrates was measured photometrically with 1P21 photomultiplier tubes located at two points in the reaction zone. No attempt was made to determine the wavelength distribution of the light. Emission intensities were observed with ethylene, propylene, ethane, dimethyl ether, tetrafluoromethane and diborane. Emission intensities with ethane, propylene, diborane and ethylene were comparable in these experiments. (Author)

AD-260 268 Div. 4, 25, 10
(28 July 61) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
THE COMPOSITION AND THERMODYNAMIC PROPERTIES FOR THE COMBUSTION PRODUCTS OF BERYLLIUM AND AIR,
by Leon V. Feigenbutz. June 61, 28p. incl. tables.
(Rept. no. ERR-SD-128)
Unclassified report

DESCRIPTORS: *Beryllium, Air, Combustion, *Beryllium compounds, Oxides, Thermodynamics, Thermochemistry, Heat of formation, Heat of reaction, Enthalpy, Entropy, Exhaust gases, Jet engine fuels, Ramjet engines.

The ideal thermodynamic properties and composition for the combustion products of Be and air are presented for pressures from 10 to the -6th power to 100 atm and temperatures from 1000 to 6000 K. The chemical species considered were gaseous N2, N, NO, O2, O, Be, BeO, (BeO)2, (BeO)3, (BeO)4 and BeO (solid and liquid). The contribution of CO2 and Ar in air were ignored. The composition of the reactants corresponds to 0.422 Be + 0.2115 O2 + 0.7885N2 in moles. The properties calculated are for an ideal mixture of pure gases, liquids, and solids. The thermodynamic properties are tabulated and presented as a Mollier chart. The compositions are reported in chart form. The boiling point, percentage of BeO condensation, and the adiabatic flame temperature for various pressures are given. The effects of melting, vaporization, and dissociation are included in the Mollier diagram.

AD-260 345 Div. 4, 14
(7 Aug 61) OTS price $7.60

Cobb Chemical Lab., U. of Virginia, Charlottesville.
STUDIES OF ANTIOXIDANT AND INHIBITOR MECHANISMS AT ELEVATED TEMPERATURES,
by James W. Cole, Jr. 25 Apr 61, 73p. incl. illus. tables, 21 refs.
(Contract AF 18(603)103)
(AFOSR-554) Unclassified report

DESCRIPTORS: *Lubricant additives, *Antioxidizers, *Oxidation inhibitors, Oxidation, *Corrosion inhibition, Corrosion research, *Phenothiazine derivatives, *Amines, Copper, *Pyridines, Catalysts, Catalysis, Synthesis, Copper compounds, Fatty acid esters, Chemical reactions, High temperature research, Labeled substances, Reaction kinetics, Hydraulic fluids, Lubricants, Additives.

A study was made of the behavior of some antioxidants and corrosion inhibitors in di-(2-ethylhexyl) sebacate under oxidizing conditions at 204 C alone and in the presence of metallic Cu and Cu compounds. Considerable attention was given to kinetic-mechanistic studies with phenothiazine and its derivatives, with phenothiazines containing radioactive S-35 and with N-C-14-methyl phenothiazine. Oxidations with some amines and pyridine derivatives, especially the dipyridylamines were also studied. The presence of Cu and certain Cu compounds enhanced the oxidation inhibiting properties of the additives. Metal coordination complexes appear to be a factor in the mechanism. The syntheses and behavior of 27 new compounds are described. (Author)

AD-260 379 Div. 4
(31 July 61) OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ON THE ANALYSIS OF LINEAR PYROLYSIS EXPERIMENTS,
by F. A. Williams. June 61, 41p. incl. illus.
39 refs. (LMSD rept. no. 3-64-61-1)
(Contract AF 49(638)412, Proj. 9751)
(AFOSR-683) Unclassified report

DESCNIPTORS: *Pyrolysis, Combustion, Decomposition, Exchange reactions, Solid rocket propellants, Sheets, Heat, Surfaces, *Chlorides, *Potassium compounds, Porosity, Gases, *Ammonium radicals, Nitrates, Perchlorates, Solids, Temperature, Reaction kinetics.

A Modified Linear Pyrolysis Experiment: A linear pyrolysis experiment utilizing a heated porous plate is proposed and analyzed. Simple and chain-like surface gasification processes are defined and discussed. The conditions under which the surface process is a rate process or one of near equilibrium are determined in the general case and for chainlike processes. It is shown that pyrolysis measurements yield the forward gasification rate in the limit of a surface rate process and the equilibrium vapor pressure in the limit of surface equilibrium. The pyrolysis rate of potassium chloride is calculated. Remarks on the Interpretation of Pyrolysis Experiments on Ammonia Salts: Previous interpretations by other investigators of linear pyrolysis rate measurements for NH4Cl, NH4NO3 and NH4ClO4 assumed that the surface process is an unopposed rate process. An alternative interpretation of pyrolysis experiments is presented which may be valid even when the surface process is near equilibrium. Features of Part One are employed to demonstrate that the difference between the plate temperature and the surface temperature of the solid may be large enough to affect seriously the activation energies which were calculated from the previous linear pyrolysis data. (Author)

AD-260 401 Div. 4
(1 Aug 61) OTS price $1.60

Rutgers U. School of Chemistry New Brunswick, N. J.
SYNTHESIS OF COMPOUNDS OF VALUE IN STUDYING THE MECHANISM OF THE ACTION OF INHIBITORS WHICH PREVENT HYDROGEN EMBRITTLEMENT OF CARBON STEELS RESULTING FROM ACID PICKLING.
Final rept. 1 Jan 56-30 Nov 60,
by D. B. Denney and Joseph Rosen. 30 Nov 60, 11p. incl. illus.
(Contract DA 30-069-ORD-1689)
Unclassified report

DESCRIPTORS: *Quinazolines, *Ketones, Hydroxides, Synthesis, Steel, *Hydrogen embrittlement, Pickling compounds, Pickling, Additives, Preparation, Corrosion inhibition, Organic compounds.

Descriptions are presented of the synthesis of the following organic materials needed in a study of the action of inhibitors of H-embrittlement of carbon steels resulting from acid pickling: (1) 6-ethoxy-3(p-ethoxy phenyl)-3,4-dihydroquinazoline, (2) 3-phenyl-3,4-dihydroquinazoline-4, (3) 6-nitro-3-p-nitrophenyl-3,4-dihydroquinazoline, (4) 6-ethyl-3-p-ethyl-phenyl-3,4-dihydroquinazoline, (5) 3-(p-N,N-dimethylamino phenyl)6-N,N-dimethylamino-3,4-dihydroquinazoline, (6) 3-p-chloro-6-chloro-3,4-dihydroquinazolone-4, (7) 3-p-methoxy-6-methoxy-3,4-dihydroquinazolone-4, (8) 3-p-bromo-6-bromo-3,4-dihydroquinazolone-4, (9) 3-p-N,N-dimethylamino 6-N,N-dimethylamino 3,4-dihydroquinazolone-4, (10) 3-p-tolyl-6-methyl-3,4-dihydroquinazolone-4, (11) 3-phenyl-3, 4-dihydroquinazoline, and (12) 3-cyclohexyl-3, 4-dihydroquinazoline.

AD-260 497 Div. 4
(31 July 61) OTS price $1.60

Delaware U., Newark.
BORON RESEARCH.
Quarterly progress rept. no. 16, 1 Apr-30 June 61, by Harold C. Beachell. 30 June 61, 11p. incl. illus.
(Contract DA 36-034-ORD-2526)
Unclassified report

DESCRIPTORS: Boron, *Boron compounds, Thio radicals, Esters, Synthesis, *Pyridines, Vacuum apparatus, Phenyl radicals, Chemical reactions, Infrared spectroscopy.

The di-n-nonyl phenylthioboronate was prepared by reacting the Na salt of nonanethiol with dichlorophenylborane. A high-vacuum line was constructed in which the thioboronate esters can be purified without heating the distillation pot, thus preventing pyrolysis. A small dry-box is being constructed with an inlet tube and cold trap as well as space for storage and manipulation of IR sample cells. The B3(SCN)3N3H3 compound was most sensitive in moist air, and vacuum manipulation appears to be mandatory to insure a good product. B-trichloro-N-triphenylborazine was reacted with KCN in benzene solvent in an attempt to replace the Cl with thiocyanate groups. Varying results from this preparation prompted a second preparation with an extended reaction time. A crop of white (slight tan) crystals were obtained. An investigation was started on the IR assignments of some borazine compounds. All compounds studied had one intense band around 1/1400 or 1/1450 cm. which has been assigned to the inplane skeletal vibration of the 6-membered B-H ring.

AD-260 569 Div. 4, 25
(3 Aug 61) OTS price $10.50

Massachusetts Inst. of Tech., Cambridge.
HIGH TEMPERATURE GAS REACTIONS. (PART V),
by Robert O. Maak. June 61, 135p. incl. illus. tables, 77 refs.
(Contract DA 19-020-ORD-4268)
(AROD-1781:3) Unclassified report

DESCRIPTORS: *Chemical reactions, *High temperature research, *Reaction kinetics, *Gases, Hydrocyanic acids, Ammonia, Thermochemistry, Hydrocarbons, Nitrogen, Graphite.

Equipment was developed to study endothermic chemical reactions requiring elevated temperatures and rapid quenches to room temperature. Two reactions were studied with this device in an attempt to produce hydrogen cyanide. One of these reactions,

$$CH_4 + 1/2N_2 \text{ gives } HCN + 3/2H_2$$

although thermodynamically very favorable at the temperature levels employed, was found to be too slow to produce HCN in any appreciable quantity. An analysis of the boundary layer flow around the filament indicated that methane decomposes by a gas-phase pyrolysis reaction. The reaction of ammonia with carbon to produce hydrogen cyanide was studied at temperatures of 1900 F. to 3300 F.

$$C + NH_3 \text{ gives } HCN + H_2$$

A comparison of the reactivity of different carbon surfaces for this reaction was obtained by employing two different forms of carbon as filaments, a standard electrode grade graphite, and pyrolytic carbon formed from the thermal decomposition of methane at 3500 F. For both types of carbon, the rate of ammonia decomposition into its constituent elements, and the rate of hydrogen cyanide formation, were found to be kinetically first order in ammonia. (Author)

5. COMMUNICATIONS

AD-260 588 Div. 4
(3 Aug 61) OTS price $1.60

George Washington Carver Foundation, Tuskegee Inst., Ala.
INVESTIGATION OF FLOWING MERCURY ELECTRODES.
Final Rept. 1 June 60-31 May 61,
by Lawrence F. Koons. 31 May 61, 14p. incl. illus.
(Contract DA 01-009-ORD-884)
(AROD-2691:1) Unclassified report

DESCRIPTORS: *Mercury electrodes, Design, Effectiveness, Electric currents, Voltage, Electrodes, Surface properties, Fluid flow.

An apparatus was devised for maintaining a flowing mercury electrode. Qualitatively, the current-voltage curves obtained with this electrode correspond to those obtained with the dropping-mercury electrode. The large currents obtainable with this electrode should result in greater sensitivity than is obtainable with the dropping-mercury electrode. The maxima which appear in the current-voltage curves obtained with this electrode appear to be associated with an increased rate of surface flow of the mercury, presumably due to a decrease in the surface tension. This observation may have a bearing on the interpretation of the maxima obtained with the dropping mercury electrode. (Author)

AD-260 659 Div. 4
(3 Aug 61) OTS price $1.60

Southampton U. (Gt. Brit.).
A STUDY OF THE EFFECT OF SUBSTITUENTS AND OF SOLVENT ON THE REACTIVITY OF THE NORMAL AND ABNORMAL POSITIONS OF UNSYMMETRICAL ORGANIC EPOXIDES.
Annual technical rept. 1 May 60-30 Apr 61,
by R. E. Parker. 20 May 61, 19p. incl. tables.
(Contract DA 91-591-EUC-1449, Proj. OI-4561-60)
Unclassified report

DESCRIPTORS: *Epoxides, *Styrenes, *Reaction kinetics, *Substitution reactions, Alkyl radicals, Methyl radicals, Chlorides, Amines, Oxides, Benzyl radicals, Molecular structure, *Solvent action, Organic solvents, Fluorides, Isomers, Methanols, Ethanols, Butanols, Pentanols, Alcohols, Chemical reactions, Synthesis.

An investigation was made on the reactivity of the normal and abnormal positions of unsymmetrical epoxides. The studies were concerned with the reaction kinetics of 6 m - and p - substituted styrene oxides with benzylamine in ethanol. Results showed that the rate of the normal reaction is increased by electron-withdrawing substituents and decreased by electron-releasing substituents, while the rate of the abnormal reaction is decreased by electron-withdrawing substituents and increased by electron-releasing substituents. Analysis of solvent effect on the reactivity of the normal and abnormal positions of unsymmetrical epoxides indicated that alcohols exert a specific accelerating effect which was attributed to H bonding between the alcoholic hydroxyl group and the epoxide oxygen atom. Within the alcohol series the rates of the normal and abnormal reactions increase with dielectric constant in an approximate linear manner.

AD-260 048 Div. 5, 8
(24 July 61) OTS price $4.60

PRD Electronics, Inc., Brooklyn, N. Y.
SPEECH BANDWIDTH COMPRESSION SYSTEM (SCANNING FILTER).
Quarterly progress rept. no. 3, 1 Feb-30 Apr 61,
by A. P. Albanese, B. Zivatofsky and L. Zolotnitsky. 30 Apr 61, 45p. incl. illus.
(Contract DA 36-039-sc-85140, Proj. NR 3B-31-01-001)
Unclassified report

DESCRIPTORS: *Speech transmission, Speech representation, Speech, Time, Frequency, *Band pass filters, Statistical analysis, Coding, Intelligibility, *Secret communication systems, *Voice communication systems, Effectiveness, Modulators, Oscillators, Tests, Probability, Amplifiers, Sidebands, Delay lines, *Telephone communication systems.

Progress is reported on a time-frequency scanning speech compression system. A statistical investigation was made to determine the scanning waveforms based upon articulation scores for selected zero crossings. Experimental results are described for the probability density of pulse period for infinitely clipped speech. Experimentation on reconstructed speech showed definite improvement in articulation using an auto-vox for reverberation. The construction of the over-all system was completed with the exception of narrow-band pass filters. Tests on the system for single side-band transmission were made to observe any deterioration of the signal. The results of articulation scores as well as sound spectrograms showed no distortion in transmission. (Author)

AD-260 093 Div. 5, 1
(25 July 61) OTS price $15.00

Bell Aerosystems Co., Buffalo, N. Y.
A STUDY OF VISUAL SIMULATION TECHNIQUES FOR ASTRONAUTICAL FLIGHT TRAINING.
Rept. on Training Equipment, Simulators and Techniques for Air Force Systems,
by T. F. Buddenhagen and M. P. Wolpin. Mar 61, 210p. incl. illus. tables, 122 refs.
(Contract AF 33(616)7028, Proj. 6114)
(WADD TR 60-756) Unclassified report

DESCRIPTORS: *Flight simulators, Training, Training devices, *Space flight, Manned, Design, *Display systems, Television, Cameras, *Television display systems, Simulation.

A study was made of the engineering requirements for visual simulation in astronautical flight training and of the basic techniques available to accomplish such simulation. An evaluation of the potentialities of the various techniques led to the choice of closed circuit television as an image transfer technique. A preliminary design concept using this technique was formulated to determine the areas in which development work will be required prior to the design of a complete simulator. This report includes a compilation of applicable techniques, a determination of the probable visual environment of space, and an investigation of a method to predict the perceptual fidelity achieved by various simulation techniques as an aid in optimizing the training value of a simulator. (Author)

AD-260 275 Div. 5, 12
(28 July 61) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPON SYSTEM 107A-2.
Program progress rept. no. 50, for June 61.
June 61. 3p. incl. illus.
(Contract AF 04(647)298)
Unclassified report

DESCRIPTORS: *Ground support equipment, Communication equipment, *Launching sites, *Communication systems, Installation, Maintenance, Public address systems, Intercommunication systems, Guided missiles, Surface to surface.

AD-260 276 Div. 5, 12
(28 July 61) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS SPACE SYSTEMS.
Program progress rept. no. 50, for June 61.
June 61, 4p.
(Contract AF 04(647)566)
Unclassified report

DESCRIPTORS: *Ground support equipment, *Communication equipment, *Launching sites, *Communication systems, Installation, Maintenance, Panel boards (Electricity), Public address systems, Intercommunication systems, Satellite vehicles.

AD-260 277 Div. 5, 12
(28 July 61) OTS price $3.60

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-1.
Program progress rept. no. 50, June 61.
June 61, 31p. incl. illus.
(Contracts AF 04(647)123, AF 04(647)312, AF 04(647)461, AF 04(647)462, AF 04(647)486, AF 04(647)495, AF 04(647)502, AF 04(647)503, AF 04(647)608, AF 04(647)609, AF 04(647)738, AF 04(647)739, AF 04(647)740, AF 04(647)741, AF 04(647)747, and AF 04(647)811)
Unclassified report

DESCRIPTORS: *Ground support equipment, *Communication equipment, *Communication systems, Installation, Maintenance, *Launching sites, *Public address systems, *Intercommunication systems, Panel boards (Electricity), *Guided missiles, Surface to surface.

AD-260 283 Div. 5, 33
(28 July 61) OTS price $1.60

Navy Electronics Lab., San Diego, Calif.
A VISUAL COMMUNICATION SYSTEM FOR ROUTING STEREOTYPED MESSAGES IN AIR TRAFFIC CONTROL.
Research and development rept. for 1 Aug 58-1 Sep 59,
by F. G. Henry and C. M. Merrow. 10 Nov 60, 18p. incl. illus. (NEL rept. no. 1003)
Unclassified report

DESCRIPTORS: *Communication systems, *Air traffic control systems, Visual signals, Test equipment, Instrumentation.

On the basis of a study of voice messages involved in internal communications in Navy radar air traffic control centers, a visual signaling system was developed to replace and/or supplement voice transmissions. Operation of the prototype system at NAS Miramar showed that it increased the flow of instrument traffic and reduced the noise level in the center. The visual communication system showed sufficient promise to warrant design of similar instrumentation to adapt it to the varying requirements of other air traffic control facilities. (Author)

AD-260 285 Div. 5
(28 July 61) OTS price $4.60

Navy Electronics Lab., San Diego, Calif.
USNEL FLIGHT DECK COMMUNICATIONS SYSTEM. PART 5. MESSAGE ANALYSIS AND PERSONNEL RESPONSE.
Final rept. Mar 56-Aug 58,
by R. G. Klumpp and J. C. Webster. 29 Nov 60, 44p. incl. illus. tables (NEL rept. no. 926)
Unclassified report

DESCRIPTORS: *Communication systems, Flight decks, Aircraft carriers, *Voice communication systems, Radio equipment, Intelligibility, Acceptibility, Effectiveness, *Radio communication systems, *Helmets, Radio transmitters, *Transmitter receivers.

This study is the last of five phases of a comprehensive program initiated to develop the USNEL Flight Deck Communications System. Other parts of the system are described in NEL Reports 922, 923, 924, and 925. This part presents an analysis of voice messages passed over the NEL Radio System and the opinions of crew members and researchers as to system effectiveness. An evaluation showed that rapid, reliable information exchange was effected among Air Department personnel on the flight deck and in the island structure during flight operations with jet and propeller aircraft. Most users believed that the radio system expedited operations and reduced confusion. (Author)

AD-260 286 Div. 5
(28 July 61) OTS price $4.60

Navy Electronics Lab., San Diego, Calif.
USNEL FLIGHT DECK COMMUNICATIONS SYSTEM. PART 2. NOISE AND ACOUSTIC ASPECTS.
Final rept. Mar 56-Aug 58,
by J. C. Webster and R. G. Klumpp. 29 Nov 60, 47p. incl. illus. (NEL rept. no. 923)
Unclassified report

DESCRIPTORS: *Communication systems, *Flight decks, Aircraft carriers, *Voice communication systems, Radio equipment, Intelligibility, Tests, Acoustics, *Helmets, Noise, Design, *Transmitter receivers, Radio transmitters, Effectiveness, Jet engine noise.

This is the second part of a five-part report covering the development and evaluation of an integrated system designed to provide reliable communications on jet aircraft carriers. This part deals with the acoustical aspects of the problem as they relate to talking and listening in high-level noise. Satisfactory voice communications in noise levels up to 135 db were obtained by use of new components and techniques. The resulting intelligibility in areas of high jet noise near the catapults was appreciably improved. (Author)

AD-260 288 Div. 5
(28 July 61) OTS price $2.60

Navy Electronics Lab., San Diego, Calif.
A METEOR SCATTER COMMUNICATIONS SYSTEM USING DIGITAL STORAGE.
Research and development rept. for July 55-25 Nov 60,
by H. E. Chubb, H. L. Heibeck, and C. G. Wilhelm.
8 Mar 61, 26p. incl. illus. (NEL rept. no. 1033)
Unclassified report

DESCRIPTORS: Radio signals, Scattering, Reflection, *Meteors, Very high frequency, *Radio communication systems, Digital systems, *Data storage systems, *Naval communications, *Radio transmission, Magnetostrictive elements, Delay lines, Radio reception, *Data transmission systems, *Radio teletype systems, Shipborne, Tests, Reliability, *Teletype systems, Communication equipment, Military intelligence.

A brief review of NEL work in the field of meteor scatter is given, and the latest experimental system, using dynamic digital techniques, is discussed. Bits, representing teletype signals, are inserted in magnetostriction delay lines and allowed to recirculate. When the presence of a suitable meteor trail is detected, the information bits are removed from the lines and transmitted in bursts at 2900 wpm. A similar device, operating essentially in reverse, is used at the receiving site to store the bits until the information can be removed at standard speed to operate a teletype printer. During field tests in April 1960, the system was operated continuously, being unattended except during normal working hours. Copy sent over the 700-mile, north-south path was printed at an average rate of 18 wpm, based on 24-hour-a-day operation, with character error rates of 0.04%. (Author)

AD-260 293 Div. 5, 2, 25
(28 July 61) OTS price $2.60

Navy Electronics Lab., San Diego, Calif.
OBSERVATIONS OF ARRIVAL ANGLES OF METEOR BURST SIGNALS AT 46.6 MC/S.
Research rept. for Sep 57-Feb 61,
by C. H. Freres. 4 Apr 61, 22p. incl. illus. table (NEL rept. no. 1036)
Unclassified report

DESCRIPTORS: *Meteors, *Radio waves, Angle of arrival, Very high frequency, Interferometers, Ionosphere, *Ions, *Diffusion, *Communication systems, Reflection.

Certain aspects of vhf meteoric propagation were studied, with the object of determining the variation of the ionospheric diffusion coefficient with height in the vicinity of 100 km, using a short-baseline interferometer. The investigation did not yield information suitable for an investigation of the height variation of the diffusion coefficient. However, the feasibility of a short-baseline interferometer for measurement of arrival angle of forward-scattered meteoric signals was demonstrated. A data sample for horizontal angles confirmed previous measurements made by other methods. (Author)

AD-260 294 Div. 5, 31
(28 July 61) OTS price $1.60

Navy Electronics Lab., San Diego, Calif.
EVALUATION OF THE PRC-53 (FORMERLY PRC-34/36) FLIGHT DECK COMMUNICATIONS SYSTEM.
by J. C. Webster and R. G. Klumpp. 18 Apr 61, 17p. incl. illus. (NEL rept. no. 1042)
Unclassified report

DESCRIPTORS: *Radio communication systems, Transmitter receivers, Walkie-talkies, Microphones, Headphones, Earphones, Helmets, Flight decks, *Aircraft carriers, Speech transmission, Intelligibility, Human engineering, Jet plane noise, Reduction, Tests.

Tests were performed on the PRC-53 (formerly the PRC-34/36) interim equipment designed for two-way flight deck communication on aircraft carriers. Laboratory and shipboard evaluation of the PRC-53 showed that: (1) it is an effective interim system, highly regarded by shipboard personnel, (2) noise limits its use at 120 to 125 db, and (3) the helmet is heavy and has no standby position; therefore, it is generally not worn until jet engines start. The PRC-53 features control equipment in primary flight control and flight deck control consisting of a suitable transmitter and receiver fed by a noise-canceling hand-held M-34 microphone and listened to over a single earphone. The portable equipment is all helmet-mounted. (Author)

AD-260 311 Div. 5, 28
(28 July 61) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
PROBLEMS IN MEETING FUTURE COMBAT SURVEILLANCE DISPLAY REQUIREMENTS,
by R. P. Devoe and J. E. Hoagbin. June 61, 15p. incl. illus. (Rept. no. 2900-275-S)
(Contract DA 36-039-sc-78801, Proj. Michigan)
Unclassified report

A speech delivered at Armed Forces - NRC Vision Committee Symposium 30-31 Mar 1961.

DESCRIPTORS: Symposia, *Display systems, Human engineering, Effectiveness, *Military intelligence, Optical images, Correlation techniques, Maps, *Data processing systems, Coding, Vision, Visual acuity, Radar interference, *Combat information centers.

Research was concerned with the complex visual displays for systems in which human operators are required to rapidly associate many different types of information and correctly correlate them. Display problems associated with the intermediate processing of combat surveillance information are discussed, and areas of research that would make possible the design of better displays are suggested. Two of the most vexing problems that are being investigated are those of clutter and keyset. The solution to these problems will require more research. (Author)

AD-260 395 Div. 5, 8, 25
(1 Aug 61) OTS price $5.60

Institute of Optics, U. of Rochester, N. Y.
EFFECTS OF SKY NOISE ON OPTICAL COMMUNICATION WITH SPACE VEHICLES,
by Gordon Milne, James Eyer, and Claude Smoyer.
9 Nov 60, 44p. incl. illus tables.
(Contract AF 30(602)1995, Proj. 55097)
(RADC TR 61-149) Unclassified report

DESCRIPTORS: *Satellite vehicles, Noise, Noise analyzers, Atmosphere, Wave transmission, Absorption, Sources, *Light communication

systems, Interference, Atmospheric refraction, Optics.

Optical communication between ground stations and orbiting satellites or space vehicles will be influenced by the properties of the intervening atmosphere; any change in signal waveform introduced by the atmosphere can be regarded as sky noise. An extensive literature survey was undertaken to determine the magnitude and wavelength dependence of the various noise contributions. An experimental program revealed some aspects of scintillation. (Author)

AD-260 457 Div. 5
(2 Aug 61) OTS price $4.60

Ohio State U. Research Foundation, Columbus.
NUMBER TELLING,
by Henry M. Moser and Wallace C. Fotheringham.
Dec 60, 33p. incl. tables (Technical rept. no. 58)
(Contract AF 19(604)6179)
(AFCCDD TN 60-40) Unclassified report

DESCRIPTORS: *Verbal behavior, *Intelligibility, *Language, Numbers, Noise, *Speech.

Intelligibility and confusability values of 16 variants of the English digits were studied in sufficient noise to produce about 50 per cent error. Ten speakers representing five different native-language backgrounds spoke the English digit variants to approximately 250 American listeners. The study provided 21540 responses to each digit; about half of these were responses to stimuli which had been filtered above 2800 cps. Results reveal a quite stable order of digit intelligibility which was: 5, 1, 7, 0, 6, 4, 9, 8, 2, and 3. Of the variants, THREE and FREE were equally intelligible and significantly better than TREE; OH, FOUR, FIVE, and NINE were significantly better than ZERO, FOWer, FIFE, and NINer, respectively. FIFE was somewhat superior to FIVE for speakers whose native-language was Spanish. The difference between filtered and unfiltered signals was statistically significant but hardly of practical importance. The digits (3) and (0) were the most frequent substitutions for other digits; (5) and (9) were the least frequently confused. At least one significant confusion exists for each of the digits. No digit avoids being a significant confusion for at least one other digit. Variants of the same digit tend to be associated with the same confusion. (Author)

AD-260 662 Div. 5
(3 Aug 61) OTS price $9.10

Electrical Engineering Research Lab., U. of Illinois.
A GENERALIZATION OF THE CUT-SET FOR APPLICATION TO COMMUNICATION NETS.
Interim technical rept. no. 19,
by Sik-Sang Yau. 25 May 61, 99p. incl. illus. tables, 32 refs.
(Contract DA 11-022-ORD-1983, Proj. TB2-0001)
Unclassified report

DESCRIPTORS: *Electrical networks, *Electronic circuits, Theory, *Communications theory, Sensitivity, Reliability, Topology, Mathematical analysis, *Radio communication systems, *Communication systems, Matrix algebra.

The usual definition of a cut-set in graph theory is extended to include both vertices and branches. This generalized cut-set is then classified in three categories. Properties of the three different classes are found and the relationship among them established. In the applications to communication nets, it is shown that all necessary cut-sets can be obtained from the incidence matrix or connection matrix. A simple method of generating these cut-sets based on the relationship among three different classes of cut-sets is derived. The generalized concept of the cut-set is applied to the analysis of the capacity, sensitivity and reliability of communication nets. A necessary and sufficient condition for a matrix to be realizable as a terminal capacity matrix of a communication net is given. A method of synthesis of a communication net is developed satisfying not only the specification of a terminal capacity matrix but also certain restrictions on the topological structure defined by a connection matrix and the sensitivity requirement with respect to any branch. (Author)

6. DETECTION

AD-260 051 Div. 6, 25
(24 July 61) OTS price $2.60

David Sarnoff Research Center, Princeton, N. J.
INFRARED PHOTOCONDUCTORS.
Interim rept. no. 10,
by M. L. Schultz, W. E. Harty, and C. D. Rowley, 31 May 61. 29p. incl. illus. tables.
(Contract Nonr-222500)
Unclassified report

DESCRIPTORS: *Infrared photoconductors, *Infrared detectors, Photoconductivity, Infrared filters, Detection, Thermal targets, Signal-to-noise ratio, Crystal detectors, Electric fields, Ionization, Germanium, Impurities, Copper, Infrared radiation, Materials, Temperature, Sensitivity.

The extrinsic infrared photoconductors which have been developed or are now under development at various laboratories permit the fabrication of infrared detectors which have long wavelength thresholds at virtually any desired position in the spectrum, even at wavelengths as great as several millimeters. In spite of the rather considerable effort which has been devoted to the investigation of impurity activated photoconductors, essentially no careful, systematic studies of the effects of variation of photoconductor parameters upon performance have been reported in the literature. The results discussed represent a first step, for one example, copper doped germanium, in the direction of obtaining such correlations. This investigation is incomplete but does give an indication of the type of relationships which exist. (Author)

AD-260 175 Div. 6, 12
(26 July 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
EQUATIONS FOR BISTATIC DOPPLER SHIFT AND RATE OF CHANGE OF DOPPLER SHIFT OF DARK SATELLITE OBSERVATIONS.
Interim rept.,
by W. D. Dahl. 9 June 61, 16p. incl. illus.
(NRL rept. no. 5622)
(ARPA Order no. 7-58) Unclassified report

DESCRIPTORS: *Doppler systems, *Position finding, Satellite vehicles, *Satellite vehicle trajectories, Equations, Digital computers.

Equations are given for the doppler shift and rate of change of doppler shift for the bistatic case where an orbiting, nontransmitting earth satellite is illuminated by a transmitter, and the reflected energy is received at different locations on the surface of the earth. These equations have been programmed for computation by the NAREC computer for any satellite for which the orbital elements are known. The results for a number of satellites have been computed, using transmitting and receiving sites of the Space Surveillance System. Plots of various relationships between doppler shift, rate of change of doppler shift, satellite height, earth-center angle between the receiver and the satellite, and zenith angle from receiver to satellite are shown for a typical satellite, 1958 Alpha, Explorer I. (Author)

AD-260 263 Div. 6, 2, 18, 12
(28 July 61) OTS price $5.60

Eastman Kodak Co., Rochester, N. Y.
SPACE BACKGROUND STUDY.
Semi-annual rept. 1 Jan-1 July 61,
by William Haynie, Charles Gramm and others.
17 July 61, 62p. incl. illus. 12 refs. (Rept. no. EK/ARD ED-692)
(Contract DA 30-069-ORD-2803)
(ARPA Order no. 39-60, Task 12)
Unclassified report

DESCRIPTORS: *Antiaircraft defense systems, *Infrared detectors, Astrophysics, *Photometers, Interstellar matter, Night sky, Infrared spectroscopy, *Infrared spectroplhotometers, Infrared radiation, *Infrared optical systems, Target recognition, Measurement, Telescopes, Optical tracking, Optical equipment, Optical target designators, Electronic circuits, Design, Infrared equipment, Thermal targets, Identification, Stars, Electronic equipment, Guided missiles, Satellite vehicles.

Research was continued on the development of the space background problem as faced by optical space defense systems operating in the infrared spectral region. Optical sensors for space applications must work in a background consisting of a multitude of point sources on the celestial sphere. This has presented a serious challenge to the designer to develop discrimination techniques for detecting essentially point targets against a stellar background. Further, the targets are relatively cold bodies (300 K) with most of their emitted energy concentrated in the far infrared. The aim is to locate and identify by theory and direct observation all thermal sources in space, stellar or otherwise, which will produce irradiances comparable to the irradiance from a relatively cold body at long range. For a preliminary measurement program, a new and improved stellar photometer was designed. Herein is described in detail the design of the optical-mechanical and electronic elements of the photometer system. (Author)

AD-260 383 Div. 6
(21 July 61) OTS price $1.60

Nortronics, Div. of Northrop Corp., Hawthorne, Calif.
DETECTOR CELL AND COOLER PACKAGE.
Quarterly rept. no. 2, 1 Oct-31 Dec 60.
20 Jan 61, 10p. incl. illus. table (Rept. no. NORT 61-13)
(Contract AF 33(616)7573, Proj. 4030)
Unclassified report

DESCRIPTORS: *Infrared detectors, Cooling, Design, Thermoelectricity, Thermocouples, Power supplies, Electronic equipment, Infrared equipment, Test sets.

Progress is reported on the development of a Peltier effect device for the cooling of an infrared detector to -78 degrees C through the use of semiconductor materials. A test set was developed which enabled the thermoelectric device to be tested at pressures down to .0001 mm Hg. A prototype two stage cooler was designed and tested. Its performance confirmed the basic calculations and has allowed the final three stage design to be completed. In design optimization studies the performance of cascaded devices was treated. A Dewar flask for the detector has been designed. Techniques for reducing junction resistance of thermoelectric devices were studied. The design of the cooler power supply was chosen.

AD-260 390 Div. 6
(31 July 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
SELECTION AND OPERATION OF INFRARED DETECTORS,
by Dowell E. Martz. 30 June 61, 33p. incl. illus. 25 refs. (NOTS TP 2678)
(NAVWEPS rept. no. 7654) Unclassified report

DESCRIPTORS: *Infrared detectors, Detectors, Detection, Infrared radiation, Effectiveness, Thermal targets, Atmosphere, Absorption, Infrared windows, Radiometers, Sensitivity, Signal-to-noise ratio, Modulation, Selection, Costs, Infrared photoconductors, Sources, Blackbody radiation.

A discussion is presented of those physical, electrical, and behavioristic parameters that must be taken into consideration in the selection of an infrared detector for any practical application. Formulas and graphical data currently used to determine the responsivity and the detectivity of infrared detector cells are given and their use is explained. (Author)

AD-260 426 Div. 6, 2, 12, 25, 8,
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
TRACKING OF MISSILES AND SPACE VEHICLES. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 12 for June 61.
30 June 61, 8p. (AID rept. no. 61-97)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Satellite vehicles, *Tracking, USSR, Electromagnetic waves, Radio waves, Ionosphere, Technological intelligence, Moon, Shock waves, Electric fields, High frequency, Microwave oscillators, Guided missile tracking systems, *Electromagnetic properties, Nonlinear systems, *Radio astronomy, *Plasma physics, Bibliography, Magnetohydrodynamics, Ionospheric disturbances.

Abstracts are presented for the following titles of articles in current Russian journals: On the absorption of cosmic radio emission in the ionosphere; Spectra of the Cassiopeia-A radio source at frequencies below 30 mc; Some features of transverse propagation of high-frequency waves in a magnetoactive plasma; Reflection and

refraction of shock waves in magnetic hydrodynamics; Determining lunar surface characteristics from observations with high-resolution radio telescopes; On the magnetic hydrodynamics for a nonisothermal plasma without collisions; Electric field of a dipole in a plasma in an external magnetic field; A sealed-off molecular oscillator with a getter-ionic pump and cooling; Nonlinear effects during propagation of electromagnetic waves in a plasma waveguide.

AD-260 440 Div. 6, 1
(1 Aug 61) OTS price $3.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
AN EVALUATION OF AN ELECTRONIC LOCATION MARKER (SARAH) FOR ARCTIC USE,
by Glenn M. Stanley and J. M. Quashnock, May 61, 36p. incl. illus. tables (Rept. no. AAL TR 61-8)
Unclassified report

DESCRIPTORS: *Markers, *Electronic equipment, Arctic regions, *Search radar, Transmitter receivers, Design, Flight testing, *Radio beacons, *Rescue beacons, Airplane antennas.

A study was undertaken to evaluate and modify the SARAH (Search and Rescue and Homing) system for use in arctic areas. The search equipment of this system was mounted on H-21 helicopters, T-33 jet trainers, and B-57 jet bombers, and special antenna systems were designed and tested for these aircraft. Flight tests were made and reliable signals from the SARAH beacon transmitter of adequate strength for homing have been received reliably at distances of 150 nautical miles. With suggested modifications, the search area covered by a single B-57 flight would be in excess of 400,000 square miles. An investigation of cold-weather batteries for use with this equipment has been started and batteries capable of operating the equipment for 20 hours at -40 F have been located. A carrier vest for the SARAH beacon has been designed, but not tested. (Author)

AD-260 511 Div. 6, 25, 30
(2 Aug 61) OTS price $1.10

Coast Guard, Washington, D. C.
SOUND SURVEY METER FOR FIELD TESTS OF FOG SIGNALS,
by J. M. O'Connell, 25 July 61. 9p. incl. illus. (Proj. no. CGTD J15-5/1)
Unclassified report

DESCRIPTORS: *Recording devices, Design, *Acoustic detectors, Measurement, *Fog signals, Calibration, Effectiveness, Determination, Sound, Detection.

Tests of a small, compact, self-contained sound measuring apparatus with a rated dynamic range of 50 to 146 decibels (re 0.0002 microbar) are reported. The instrument tested was a General Radio Type 1555-AS3 Sound Survey Meter with a ceramic microphone on an extension cable. Frequency response of the meter was investigated as a function of sound pressure level. Dynamic response at 1000 cps as a function of sound pressure level and temperature dependence of 1000 cps are also reported. The report concludes the device can measure the output of most Coast Guard fog signals within + or - 2 decibels. (Author)

AD-260 707 Div. 6, 30
(7 Aug 61) OTS price $8.10

Research Inst., U. of Michigan, Ann Arbor.
SIMRAR, SIMULATED RECEIVER AND RECORDER FOR STATISTICAL MEASUREMENTS,
by D. W. Fife. Jan 61, 80p. incl. illus. tables. (Technical rept. no. 118; Rept. no. 2899-43-T) (Contract DA 36-039-sc-78283, Proj. 3A99-06-001-01)
Unclassified report

DESCRIPTORS: *Radio signals, *Radar signals, Detection, *Radio receivers, *Radar receivers, *Recording devices, Simulation, Signal-to-noise ratio, Statistical tests, Statistical analysis, Measurement, Electronic circuits, Band pass filters, Band pass amplifiers, Amplifiers, Video signals, Probability, Identification, Design, Tests, Test equipment, *Radio interception, *Radar interception, Switching circuits.

SIMRAR (SIMulated Receiver And Recorder) is a special purpose analog simulator, incorporating circuits for statistical measurements and recording. The equipment was designed and built for use in experimental studies of receiving systems for the detection of signals in noise. The equipment is used for statistical studies of signal detection by receivers employing fixed observation time, or sequential decision processes. Considerable versatility in simulation is provided through the use of operational amplifiers, a function generator, and the general switching circuits included in the equipment. The recording circuits may be used exclusive of the simulation for general statistical measurements. (Author)

7. ELECTRICAL EQUIPMENT

AD-260 002 Div. 7
(25 July 61) OTS price $2.60

Naval Ordnance Lab., Corona, Calif.
AN ANALYSIS OF POWER DISTRIBUTION RELATIVE TO THE DESIGN OF HIGH ENERGY DENSITY BATTERIES,
by William C. Spindler. 15 July 61, 24p. incl. tables.
(NAVWEPS rept. no. 7184) Unclassified report

DESCRIPTORS: *Primary batteries, *Guided missile batteries, Polarization, Design, Electric power production, Mathematical analysis, Power supplies, Numerical methods and procedures.

An analysis is presented of the important aspects of power distribution between a generator and its load, with respect to operating current density, when rapid, high-energy transfer is required. The general equations are developed for the basic ohmic circuit and are illustrated for a 1200-watt battery application. Various representations of transfer efficiency are examined, and an optimum power transfer point is defined at approximately half the current density required for maximum load power. The effects of polarization characteristics on maximum power transfer are briefly discussed. The study shows that the theoretical limit of 25% which applies to linearly polarized systems can be exceeded for higher order polarization (such as cubic), but may not reach that limit for lower order polarization (such as logarithmic). (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-260 044 Div. 7, 8
(24 July 61) OTS price $9.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STABILITY ANALYSIS OF TWO-PARAMETER CONTROL SYSTEMS,
by Martin L. Shooman. June 61, 105p. incl. illus.
(Research rept. no. PIBMRI-920-61)
(Contracts AF 18(600)1505 and AF 18(603)105)
(AFOSR-997) Unclassified report

DESCRIPTORS: *Control systems, *Servo systems, Servomechanisms, Mathematical analysis, Differential equations, Operational calculus, Stability, Nonlinear systems, Non-linear differential equations, Feedback.

This dissertation treats the problem of stability in 2 parameter control systems. The 2 parameters may be loop-gains, time constants, natural frequencies, damping constants, or describing function gains representing system nonlinearities. The limitations of single parameter analysis techniques are discussed and parameter plane analysis introduced. The 2 system parameters are plotted along the coordinate axes in the parameter plane. The left-half-plane and the j omega axis of the s-plane are mapped into a stable region and a stability boundary respectively, in the parameter plane. The parameter plane plot delineates the ranges of the 2 system parameters that yield stable operation. The Routh Table or other similar stability criteria are used to obtain the stability boundary in the parameter plane. Using appropriate mapping transforms, performance boundaries may be obtained. These transformations allow a mapping of lines of constant sigma in the left-half-plane into the parameter plane. Analog computer methods are discussed that allow experimental location of stability and performance boundaries in complex problems. The parameter plane method of analysis was applied to a system with 2 nonlinearities. Three means of analyzing 3 and more parameter systems are also discussed. (Author)

AD-260 066 Div. 7, 25
(25 July 61) OTS price $8.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DESIGN STUDY FOR ADVANCED SOLAR THERMIONIC POWER SYSTEMS. ITEM II - PART II. CLOSE-SPACED VACUUM THERMIONIC GENERATOR.
Interim summary technical rept. no. 1.
Sep 60, 91p. incl. illus. tables (Engineering rept. no. 4166)
(Contract AF 33(616)7411, Proj. 0(3-3145); Subcontract to Thermo Electron Engineering Corp., Cambridge, Mass.)
(WADD TR 60-698, pt. 2) Unclassified report

DESCRIPTORS: *Thermionic emission, *Power supplies, Solar energy, Generators, Vacuum systems, *Solar cells, Thermoelectricity, Voltage regulators, Diodes, Effectiveness, Design, Electron bombardment, Direct current.

A survey was made of the state of the art of thermionic power generation as part of a design study for advanced solar thermionic power systems. The results of the survey serve as a basis for the preparation of a detailed design and test specification for 2 laboratory test models of thermionic generators. The design involves the construction of 98 cells with 1-inch square emitters. Groups of 7 cells will be mounted on each of 14 trays, which form the sides of a polygon. Electrically, the unit consists of 2 parallel banks of 49 series connected cells. The operating temperature of the unit is 1500 K. The necessary heat input is 4000 w. This heat input is provided by radiation from a tantalum cylinder which is heated to 2000 K by electron bombardment. This method of electrical heating is considered to be superior to resistance heating mainly because of structural problems at the high operating temperatures of the source. (Author)

AD-260 068 Div. 7, 25
(25 July 61) OTS price $8.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DESIGN STUDY FOR ADVANCED SOLAR THERMIONIC POWER SYSTEMS ITEM III. ELECTRICAL CHARACTERISTICS STUDY.
Interim summary technical rept. no. 2,
1 Dec 60, 83p. incl. illus. (Engineering rept. no. 4262)
(Contract AF 33(616)7411, Proj. 0(3-3145) Subcontract to Thermo Electron Engineering Corp., Cambridge, Mass.)
(WADD TR 60-872) Unclassified report

DESCRIPTORS: *Thermionic emission, *Power supplies, Solar energy, Generators, Vacuum systems, Cesium, Vapors, Diodes, *Solar cells, Design, Effectiveness, Space environmental conditions, Tests, Voltage regulators, Direct current, Electrical properties, Theory, *Plasma physics, Electron bombardment.

Results of a theoretical and experimental study of electrical characteristics of cesium-vapor and vacuum thermionic generators are presented. The results indicate that a non-optimized cesium converter can give the predicted performance. A wire spacer technique for vacuum diodes was investigated and proven entirely successful. This technique offers substantial advantages over sapphire spacers and simplifies considerably the design for the 250-watt vacuum generator. The response of both cesium and vacuum generators to sudden changes in load appears to be instantaneous for all practical purposes, thereby permitting the use of switching type voltage regulators which offer particular advantages in space applications. (Author)

AD-260 153 Div. 7
(3 Aug 61) OTS price $1.60

National Carbon Co., Inc., Cleveland, Ohio.
FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION POWER BATTERIES.
Quarterly technical progress rept. no. 12,
15 Mar-15 June 61,
by M. L. Kronenberg, E. M. Klopp and S. Senderoff.
15 June 61, 14p. incl. table.
(Contract NOrd-18240)
Unclassified report

DESCRIPTORS: *Power supplies, *Primary batteries, *Cathodes (Electrolytic cell), Materials, Potassium compounds, Lithium compounds, Chlorides, Sulfates, Eutectics, Electrolytes, Electrodes, Salts, Solubility, Electric potential, Potentiometers, Reduction, Measurement, Determination, Electrolytic cells, Diffusion, Phosphates, Silver.

The diffusion coefficient of Ag in KCl-LiCl was determined. The value differed from data obtained by chronopotentiometry by a factor of 7.

The experiment is to be rerun using radioactive tracer techniques for greater sensitivity. About 250 test cells, principally involving CuO, various sulfates, and phosphates, were prepared and evaluated. Based on active material alone (anode weight plus the calculated amount of cathodic material for complete reaction) CuO gave a maximum of 282 whr/lb; the phosphates and sulfates gave maximums of 256 and 310 whr/lb, respectively. On the basis of total balanced cell weight, the phosphates gave a maximum of 175.1 whr/lb while the sulfates gave 141 whr/lb; CuO on the same basis gave 182.4 whr/lb.

AD-260 156 Div. 7
(26 July 61) OTS price $2.60

Coast Guard, Washington, D. C.
TESTS OF THE GENERAL RAILWAY SIGNAL COMPANY POLYCHROME RANGE LIGHT.
30 June 61, 23p. incl. illus. tables (Rept. no. 245)
(Proj. no. CGTD J24-2/3-2-1)
Unclassified report

DESCRIPTORS: Filaments, *Glow lamps, Measurement, Lenses, Voltage, Analysis, *Signal lights, Incandescent lamps, Effectiveness, Tests.

Candlepower measurements of the General Railway Signal Company polychrome range light are presented for eleven low voltage lamps with wattages up to 25 watts. The effect of filament shape on beam intensity distribution is discussed in detail. It was concluded that type B polychrome assembly is superior to the type A since it provides better sector definition. Lamps with CC-6 filaments produced better results than lamps with C-2R or C-2V filaments. Candlepowers from 700 to 14,000 candles were measured for the 3.5 volt 0.3 ampere lamp and the 10 volt 25 watt lamp. (Author)

AD-260 347 Div. 7, 4
(31 July 61) OTS price $5.60

California Research Corp., Richmond.
INVESTIGATIVE STUDY RELATING TO FUEL CELLS.
Quarterly rept. no. 4, 26 Jan-25 Apr 61.
26 June 61, 55p. incl. illus. table.
(Contract DA 49-186-502-ORD-929)
Unclassified report

DESCRIPTORS: *Fuel cells, Electrochemistry, Chemical reactions, Reaction kinetics, Power supplies, Electrodes, Electrolytic cells, Acids, Methanols, Electrolytes, Formaldehyde, Propanes, Formic acids, Oxidation, Hydrocarbons, Surfaces, Deuterium, Cyclohexanes, Pentanes, Octanes, Cyclohexenes.

Product studies with methanol in an acid electrolyte fuel cell were continued. More reliable formic acid analyses were obtained. These results show definitely that formaldehyde and formic acid are both intermediates in acid electrolyte but that they are present only in low concentrations. The nonelectrochemical disappearance of formaldehyde was investigated. Propane fuel cell studies were resumed. The studies of the cyclic voltammetric behavior of methanol, formaldehyde, and formic acid or formate were extended over the pH range of about -1 to 15. The results of the chronopotentiometric study of the anodic oxidation of methanol in basic solution were reevaluated. Chemisorption studies of hydrocarbons on nickel-on-silica were extended to n-pentane, hexene-1, and isooctane (2,2,4-trimethylpentane). It was found that all yield hydrogen atoms on the nickel surface by the process of dissociative adsorption. (Author)

AD-260 353 Div. 7
(31 July 61) OTS price $5.60

Eagle-Picher Research Labs., Joplin, Mo.
RESEARCH ON AMMONIA BATTERY SYSTEM.
Quarterly rept. no. 3, 1 Jan-1 Apr 61,
by D. J. Doan, G. F. Sieglinger, and E. M. Morse.
1 Apr 61, 51p. incl. illus.
(Contract DA 36-039-sc-85396, Proj. 3A99-09-001)
Unclassified report

DESCRIPTORS: *Primary batteries, *Wet cells, Ammonia, Liquefied gases, *Electrolytes, Battery separators, Cathodes (Electrolytic cells), Materials, Binders, Polarization.

Squib activation of multicell units presented several mechanical and chemical difficulties due to the high speed influx of electrolyte. Use of single cells duplicating these conditions has shown the need to change the binder and both separator materials to counteract the action. Polarization studies have been begun which permits the identification of the limiting factors. Screening tests for new cathode materials have been continued with no new high rate materials but several potential low rate compounds are found. (Author)

AD-260 357 Div. 7, 8, 25
(31 July 61) OTS price $1.60

General Electric Co., Schenectady, N. Y.
A CESIUM VAPOR THERMIONIC CONVERTER USING A THORIUM DISPENSER CATHODE,
by J. M. Houston. May 60, 11p. incl. illus.
(Scientific rept. no. 1)
(Contract AF 19(604)5472)
(AFCRL-253) Unclassified report

DESCRIPTORS: *Thermionic emission, Cesium, Vapors, Thorium, *Cathodes (Electron tubes), Design, Tests, Generators, Copper electrodes, *Power supplies.

A thermionic heat-to-electricity converter was tested which consisted of 13.3 sq cm Th dispenser cathode spaced 1 mm from a cu or fernico anode. Current-voltage characteristics and power output were taken as a function of cathode temperature and Cs pressure. At a cathode temperature of approximately 2200 K, an anode temperature of 450 K, and a Cs pressure of 0.02 mm, a dc power output of 42 w (30 amp at 1.41 v) was delivered to a resistive load at an over-all efficiency of 7%. The effect of anode temperature on converter power output was explored by recording a series of current-voltage plots at different anode temperatures. The power output went through a maximum at an optimum anode temperature where the anode work function was minimum (optimum Cs coverage). The changes in anode work-function were also observed by measuring the thermionic emission from the anode. The effect of an applied axial magnetic field on the converter output was explored. At low Cs pressures a field of 20 gauss reduced power output to 2/3 of its zero-field value. At high Cs pressures a magnetic field of 80 gauss had no measurable effect on converter output. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-260 358 Div. 7, 8
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
VACUUM THERMIONIC ENERGY CONVERTER,
by J. E. Beggs. July 60, 28p. incl. illus. table, 11 refs. (Scientific rept. no. 2)
(Contract AF 19(604)5472)
Unclassified report

DESCRIPTORS: *Thermionic emission, Vacuum systems, *Power supplies, Electrodes, Effectiveness, Materials, Heat, Generators, Design, Heating, *Heat engines, Diodes.

The utilization of materials and techniques employed in building electron tubes for use at high ambient temperatures and in high density nuclear fluxes provide a basis for the construction of a high vacuum thermionic energy converter. Heat is applied to the external surface of one electrode of the converter. The interior surface of this hot electrode operates in a vacuum and is coated so that it is capable of emitting copious numbers of electrons. The other electrode of the converter has a coating on its interior surface that can provide a low anode work function so as to increase the energy available to an external load. The output and efficiency of a vacuum thermionic energy converter improve as the emitter is heated hotter and as the electrodes are spaced more closely. At an emitter temperature of 1100 C an output of 1 watt/sq cm and an efficiency of 4.5% were attained. In practical applicaations heating can be accomplished by the use of chemical fuel, solar radiation, or nuclear energy. (Author)

AD-260 359 Div. 7, 12
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
TESTS OF A CESIUM THERMIONIC CONVERTER DESIGNED TO UTILIZE SOLAR ENERGY IN OUTER SPACE,
by V. C. Wilson and Jackson Lawrence. Aug 60, 25p. incl. illus. table (Scientific rept. no. 3)
(Contract AF 19(604)5472)
(AFCRL-281) Unclassified report

DESCRIPTORS: *Thermionic emission, Cesium, *Power supplies, Solar energy, *Generators, *Heat engines, *Heat transfer, Effectiveness, Design, *Space flight, Tests, Solar cells, Space environmental conditions.

A cesium thermionic converter with an integral radiator for solar application was designed and tested. Design, construction and processing techniques are discussed. Performance data under various operating conditions are given including a maximum output power at 1800 C of 85 watts with 15% efficiency. The electric generator and reject heat radiator weighs 7.5 lbs per kilowatt of output electricity. (Author)

AD-260 362 Div. 7, 25
(31 July 61) OTS price $1.60

General Electric Co., Schenectady, N. Y.
THERMIONIC EMISSION FROM A TANTALUM CRYSTAL IN CESIUM OR RUBIDIUM VAPOR,
by H. F. Webster. Mar 61, 12p. incl. illus.
(Scientific rept. no. 6)
(Contract AF 19(604)5472)
(AFCRL-284) Unclassified report

DESCRIPTORS: *Thermionic emission, Cesium, Vapors, Rubidium, Alkali metals, *Tantalum, Crystals, Measurement, Determination.

Thermionic emission was measured from a Ta crystal which has had its work function altered by an adsorbed layer of Cs or Rb. The emission density is strongly dependent upon the crystallographic face of the Ta, and the 110 face yields the peak emission for both of the alkali metals used. An additional emission peak is obtained from the 100 face when Rb is used. Details of the measurement technique are presented. (Author)

AD-260 368 Div. 7, 25
(31 July 61) OTS price $5.60

General Electric Co., Syracuse, N. Y.
OPTIMIZATION OF THERMOELECTRIC ENERGY CONVERTERS.
Bimonthly progress rept. no. 2, 15 June-14 Aug 60, ed. by Philipp H. Klein. 14 Aug 60, 49p. incl. illus. tables.
(Contract NObs-78403)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Thermal conductivity, Encapsulation, Oxides, Magnesium compounds, Titanium compounds, Seals, Dioxides, Ceramic materials, Lead compounds, Tellurides, Antimonides, Materials, Digital computers, Thermal insulation, Electric power production, Convection, Cooling, Simultaneous equations, Coolants, Sea water.

A preliminary analysis of the first thermal system to be investigated was nearly completed. This system consists of saturated steam at 533 K (500 F), a thermoelectric generator utilizing thermoelectric materials representative of the present state of the art, and a sea-water heat sink at 291 K (65 F). A magnesia-titania ceramic body was tested and found to be a material suitable as a high-temperature encapsulating medium in conjunction with iron end-caps. Improvements in sealing technology include the construction of an improved sealing apparatus and its use for closing an easily-filled cell that will facilitate the study of thermoelectric properties of encapsulated materials. Encapsulation of p-type lead telluride was successfully accomplished. (Author)

AD-260 424 Div. 7, 13
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
ELECTRIC POWER IN COMMUNIST CHINA.
20 June 61, 2p. (AID rept. no. 61-94; Trans. from The Rapid Increase of Electric-power Capability in New China. Elektrie 1, pp. 3-4, Jan 60)
Unclassified report

DESCRIPTORS: *Electric power production, Power plants, China, Technological intelligence, Transmission lines, *Electricity, Economic conditions.

Progress is reported on electric power production in Communist China. Results of the first five-year plan are discussed, as well as developments in 1958 and 1959. Statistics are given and locations of some new plants are mentioned.

AD-260 515 Div. 7, 19
(3 Aug 61) OTS price $3.60

Coast Guard, Washington, D. C.
HYDROGEN ACCUMULATION IN THE BATTERY POCKETS OF BUOYS WITH LEAD-ACID BATTERIES.
20 July 61, 35p. incl. illus.
(Proj. CGTD A25-1)
Unclassified report

DESCRIPTORS: *Buoys, Hydrogen, Electricity, *Storage batteries, Measurement, Ventilation ducts, Valves, Mathematical analysis, Tests.

This report is a comprehensive study of the causes and prevention of hydrogen gas accumulation in electric lighted buoys powered by lead-acid storage batteries. The chemistry of possible causes of hydrogen evolution is discussed. Measurements of hydrogen concentration in various lighted buoys are presented. Results showed a high percentage of buoys with explosive mixtures in battery pockets. Increasing the size of ventilation tubing and converting to an open-type vent valve reduced the hydrogen gas concentration below the lower explosive limit. (Author)

AD-260 574 Div. 7
(3 Aug 61) OTS price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
USE OF TIME-VARYING FEEDBACK GAIN TO IMPROVE SYSTEM RESPONSE.
Master's thesis,
by John V. Abbate. 19 May 61, 35p. incl. illus.
(Rept. no. PIBMRI-917-61)
(Contract DA 30-069-ORD-1560)
(AROD rept. no. 1538:17) Unclassified report

DESCRIPTORS: *Servomechanisms, *Feedback, Differential equations, Mathematical analysis, Operational calculus, Complex variables, Integral transforms, Numerical analysis, Control systems.

The rise time of the unit step response of a second order system is shown to be improved by means of a feedback loop consisting of an exponentially time-varying gain. Analysis of the proposed system essentially consists of determining the solution of a linear differential equation with time-varying coefficients. A good approximation to the solution is readily obtained by the application of Laplace Transform Theory to Picard's Theorems on Existence and the Method of Successive Approximations. (Author)

AD-260 629 Div. 7
(4 Aug 61) OTS price $5.60

Gulton Industries, Inc., Metuchen, N. J.
THE TESTING OF HERMETIC SEALS AND SEPARATORS, POSITIVE PLATE STUDIES, AND INVESTIGATIONS ON THE UNIFORMITY OF SEALED NICKEL-CADMIUM CELLS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, on Investigations Leading to the Development of Improved Sealed Nickel-Cadmium Batteries,
by H. N. Seiger. 31 Mar 61, 45p. incl. illus. tables.
(Contract DA 36-039-sc-85390)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Seals, Design, *Battery separators, Electrodes, Ceramic materials, Metal seals, Test methods, *Anodes (Electrolytic cells), Nickel, Cadmium, *Storage batteries.

Ceramic-to-metal seals are now produced consistently. Accelerated testing of separator materials was completed, and the properties of separators are reviewed. Overcharge data were obtained on 6 cells. The data consists of the capacity, Tafel slope and pressure slope. Several cells with a ratio of negative to positive capacity near unity, were brought into several different states of charge. These cells were then pressured with oxygen and the pressure decrease obtained. The question of oxygen adding capacity to a cell was investigated, and a negative answer obtained. The oxygen evolution data was analyzed on a phenomenological basis. The theory of the analysis was developed. It appears that pure nickel has 2 sources of oxygen which have half-times of 9 and 102 minutes respectively. A third self-discharge process is also occurring, but no data has been obtained on this. The doped electrodes have 2 self-discharge processes which are suspected of being one oxygen source undergoing sequential decay. The potential decay data is reported as the Tafel slopes. (Author)

AD-260 660 Div. 7
(4 Aug 61) OTS price $10.50

Westinghouse Electric Corp., Cheswick, Pa.
THERMOELECTRIC MODULE IMPROVEMENT PROGRAM.
Rept. no. 1 for 1 July 60,
by P. S. Merrill, L. Selwitz and others. 1 July 61, 136p. incl. illus. tables.
(Contract NObs-84329)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Electric power production, Thermocouples, Military requirements, Tests, Thermal conductivity, Dielectrics, Thermal insulation, Encapsulation, Thermal stresses, Lead compounds, Tellurides, Manufacturing methods, Life expectancy, Test equipment, Germanium compounds, Bismuth compounds, Distortion, Heat engines.

Research concerns the improvement of thermoelectric modules over the state of the art as expressed by the 5 KW generator type modules and by competing devices. Since many of the attributes of thermoelectric power conversion are well known, this report attempts primarily to define the problems that require solution before thermoelectric generators can be built with the performance characteristics and reliability required for military applications. Generator analysis and design for a nuclear reactor-thermoelectric, high heat flux system is discussed. A summary of 5 KW generator performance characteristics is as follows: Actual power output 5980 watts gross at a module efficiency of 4.7 per cent. Power output on the basis of best module performance would have been 7570 watts at a module efficiency of 5.7 per cent. Power output on the basis of best thermocouple performance would have been 10,600 watts at 7 per cent efficiency. Life tests on a single couple have exceeded 11,000 hours. Module life was limited to approximately 1000 hours primarily by hot side electrical insulation failure. (Author)

AD-260 700 Div. 7, 22, 12, 4
(7 Aug 61) OTS price $8.10

Eastman Kodak Co., Rochester, N. Y.
HIGH ENERGY BATTERIES.
Final rept. 15 June 58-14 June 61.
31 July 61, 88p. incl. illus. tables (Rept. no. EK/ARD ED-670)

(Contract NOrd-18249; In cooperation with G. & W. H. Corson, Inc., Plymouth Meeting, Pennsylvania)

Unclassified report

DESCRIPTORS: *Power supplies, *Torpedo batteries, *Guided missile batteries, Wet cells, Magnesium, Sulfur compounds, Ammonia, Electrolytes, *Primary batteries, Electrochemistry, Cathodes (Electrolytic cell), Effectiveness, Design, Carbon.

An investigation into the feasibility of high energy battery based on the use of the magnesium-sulfur couple in an electrolytic solution in liquid ammonia indicated that it is possible to obtain as much as 50 watt-hours per pound of cell structure (electrodes, electrolyte, and spacers) at a 15-minute rate. Translation into an automatically activated battery would probably reduce this value to less than 20 watt-hours per pound. There is little change in output between -40 C and +20 C. The battery could presumably be used at considerably lower and higher temperatures with nearly the same output. Whereas such a battery appears to be competitive with other automatically activated reserve batteries, especially for low-temperature service, it delivers about 7% of the desired output of 250 watt-hours per pound. Therefore, it is concluded that the feasibility of very high energy batteries was not demonstrated. (Author)

AD-260 739 Div. 7, 4
(8 Aug 61) OTS price $4.60

General Electric Co., West Lynn, Mass.
RESEARCH ON LOW TEMPERATURE FUEL CELL SYSTEMS.
Progress rept. no. 15, 15 Dec 60-15 Feb 61, 15 Feb 61. 44p. incl. illus, tables.
(Contract DA 44-009-eng-3771)

Unclassified report

DESCRIPTORS: *Fuel cells, Low temperature research, Power supplies, Electrochemistry, *Electrodes, Catalysis, Catalysts, *Oxygen electrodes, Porous materials, Plastics, Polymers, Fluorides, Ethylenes, Materials, Platinum, Carbon, Tests, Powder metals, Hydrocarbons, Ion exchange, *Hydrogen electrodes, Alkaline cells.

Porous catalyst screen electrodes and conducting porous teflon electrodes have been employed in a continuing survey of electrocatalyst materials, the survey of metal powders in alkaline electrolyte cells is nearly completed. Several compounds have been evaluated as catalyst materials and also some carbon supported catalysts have been prepared and evaluated in cells. Work on the characterization of different platinum catalysts has been continued. Coulometric and surface area data have been obtained for additional samples of platinum blacks. A matrix cell having reference electrodes has been constructed and its performance tested with a Kordesch-Marko bridge. In the course of evaluation studies, one alkaline matrix cell was operated briefly on H and O at current densities as high as 340 ma/sq cm. (Author)

AD-260 786 Div. 7, 8
(8 Aug 61) OTS price $8.10

Temco Electronics, Dallas, Tex.
INVESTIGATION OF SILICON CONTROLLED RECTIFIERS FOR STATIC POWER CONVERSION.
Quarterly progress rept. no. 2, 1 Oct 60-1 Jan 61,
by G. P. Underbrink. 20 Mar 61, 75p. incl. illus. tables (Rept. no. TER 611.1905)
(Contract DA 36-039-sc-85381)

Unclassified report

DESCRIPTORS: Silicon, *Rectifiers, Power supplies, Transistors, Inverter circuits, Electrical equipment, Electric currents, Electrical properties, Radiofrequency filters, Impedance, Radio interference, Reduction, Noise (Radio), Commutators, Electronic circuits, *Oscillator circuits, Design, Harmonic analysis, Transients, Mathematical analysis, Power transformers, Tests.

A qualitative comparison is made of seven fundamental silicon controlled rectifier (SCR) power inverter systems categorized by their regulation method. Treatment is given to filtering, loading, impedance, and efficiency characteristics, to commutation requirements and radio interference suppression techniques, and to subcircuit requirements. Experimental evaluation is conducted of basic series and parallel inverter systems. A 1000 VA regulated SCR parallel inverter is designed and breadboarded and preliminary qualification tests (regulation, loading, efficiency and distortion) are presented. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-260 014 Div. 8, 25
(20 July 61) OTS price $6.60

Institute of Mathematical Sciences, New York U., N. Y.
DIFFRACTION OF SCALAR WAVES BY A CIRCULAR APERTURE II,
by J. Bazer and H. Hochstadt. Apr 61, 62p. incl. illus. (Research rept. no. EM-170)
(Contract AF 19(604)5238)
(AFCRL-312) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Integral equations, Mathematical analysis, *Diffraction.

The problems of diffraction by a circular aperture in a perfectly soft and in a perfectly rigid infinite, planar screen are discussed. Attention is focused primarily on the low-frequency end of the spectrum where the product of the wave number and the aperture radius is small. (Author)

AD-260 015 Div. 8
(21 July 61) OTS price $1.60

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
INVESTIGATION OF SOME 455-KC PIEZOELECTRIC CERAMIC FILTERS,
by H. B. Martin. 26 June 61, 11p. incl. illus. table (Rept. no. NADC-EL-6135)
(Proj. TED no. ADC AV-44011) Unclassified report

DESCRIPTORS: *Ceramic material, Design, Aircraft equipment, *Piezoelectric materials, Communication equipment, *Electric filters, Transistor amplifiers, Miniature electronic equipment.

A laboratory evaluation was made of the Clevite Research Center type TF-01A and TO-01A piezoelectric ceramic filters. The results indicated that filters of this type have properties which may have some application in avionics equipment. Activities responsible for the design of communications equipment should acquaint themselves with these devices. (Author)

AD-260 025 Div. 8, 2
(24 July 61) OTS price $2.60

Naval Missile Center, Point Mugu, Calif.
MICROWAVE TROPOSPHERIC STUDY.
Progress rept. for 1959,
by W. Dotts and E. B. Miggantz. 7 July 61, 24p. incl. illus. (Technical memo. no. NMC TM 61-24)
Unclassified report

DESCRIPTORS: *Microwaves, Atmosphere, *Atmospheric refraction, Refractive index, Measurement, Meteorological data, *Radio waves, Propagation, *Refractometers, Airborne, Electromagnetic waves, Recording devices, Wave transmission, California.

The Naval Missile Center has conducted refractive index measurements in the Southern California coastal area over a period of 6 years (1954 through 1959). The refractive index profiles obtained over this 6 year period were analyzed to determine the frequency of occurrence of ducting, super-standard, and sub-standard layers. The results show that the probability of ducting layers occurring in the Southern California constal area is high in July (100%) and August (88%) and low (below 50%) in April, September, November, and December. The probability of sub-standard layers occurring in January to June and in October to December is low (below 10%) except in April (57%). The probability of super-standard layers occurring in January to March, and June to December is low (below 30%) except in August where the occurrence is high (43%). (Author)

AD-260 041 Div. 8, 25
(21 July 61) OTS price $5.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
OPTICAL TECHNIQUES FOR CURRENT DENSITY MEASUREMENTS IN GASEOUS PLASMAS,
by Menachem Balfour. 3 May 61, 53p. incl. illus.
(Research rept. PIBMRI-910-61)
(Contract AF 30(602)2149)
(RADC TN-61-124) Unclassified report

DESCRIPTORS: Electron optics, Optical instruments, *Plasma physics, Electric currents, Density, Light, *Gas discharges, Glow discharges, *Electronic switches.

The distributions in current densities in a gaseous plasma is a quantity of great interest to those concerned with basic plasma research. The development is described of an external measuring technique applicable to the determination of current density variations in a plasma. This technique, utilizing suitably designed optical and electronic apparatus, introduces no secondary effects in the media being studied. A theoretical model relating light emanating from a gaseous plasma to its current density variations is used as a motivation for the development of appropriate instrumentation. An experimental program designed to test the feasibility of spatial, temporal, and spectroscopic resolution of the light output of a plasma in a manner consistent with the model, is described. On the basis of the results of this program, additional design criteria become apparent. The potential of optical current density measuring techniques in basic plasma research is discussed. (Author)

AD-260 045 Div. 8, 25
(24 July 61) OTS price $5.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF SURFACE WAVES ALONG THE BOUNDARY OF TWO COAXIAL CYLINDRICAL DIELECTRIC COLUMNS IN A CIRCULAR CYLINDRICAL METALLIC WAVEGUIDE WITH EXCITATION BY A MAGNETIC RING CURRENT,
by Surendra Nath Samaddar, 7 Oct 60. 56p. incl. illus. tables (Research rept. no. PIBMRI-857-60)
(Contract AF 19(604)4143)
(AFCRL-79) Unclassified report

DESCRIPTORS: *Waveguides, *Plasma physics, Electromagnetic waves, Propagation, Microwaves, Microwave amplifiers, Microwave oscil-

lators, Mathematical analysis, Differential equations, Partial differential equations, Matrix algebra, Transmission lines, *Magnetic fields, Bessel functions, Wave transmission.

The field generated by a magnetic current ring in a waveguide of circular cross-section partially filled with plasma is calculated. The waveguide is divided into 2 parts (an inner cylindrical region and the remainder), one of which is filled with homogeneous plasma, the other being empty. The current is assumed to be independent of angle. The field is studied in the case of zero or infinite axial dc magnetic field. (Author)

AD-260 053 Div. 8, 26
(21 July 61) OTS price $7.60

RCA Defense Electronic Products, Camden, N. J.
DEVELOPMENT OF RESISTOR MICROELEMENTS.
Formal engineering rept. on Micro-Module Production Program.
17 Mar 58, 71p. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: *Resistors, *Subminiature electronic equipment, Materials, Aluminum, Surface properties, *Manufacturing methods, Coatings, Production, Tests, Design, Reliability, Test equipment, Costs, Electrical properties, Mechanical properties, Thermal conductivity, Thermal expansion, Metal films, Oxides, Aluminum compounds, Life Expectancy, Encapsulation.

Results are presented of the task to produce precision resistors in the micro-module form factor. The over-all micro-module objectives of reliability, miniaturization, suitability for automatic processing, and a component density of 600,000 parts per cubic foot were the requirements. An investigation was made of possible substrate materials for resistors. The strength, thermal conductivity, thermal expansion, moisture resistance, surface condition and electrical resistivity of various materials were investigated. Alumina was selected and alumina wafers were produced by dry pressing or by slicing and grooving of ceramic bars. In the area of terminations, many microelements were excessively thick due to solder buildup. This problem was solved by reducing the temperature of the solder pot into which these elements were dipped for tinning. The elements were then removed from the solder pot slowly so that the excess solder was wiped off the elements by the surface tension of the solder. It was found that a protective coating applied to the resistors during the last step in manufacture changed the resistance values slightly. The sequence of the process was changed so that the final testing followed the application of the coating. (Author)

AD-260 054 Div. 8
(21 July 61) OTS price $5.60

Electronics Research Lab., Illinois Inst. of Tech., Chicago.
STUDY OF I-F TRANSFORMERS FOR SINGLE SIDEBAND OPERATION.
Quarterly progress rept. no. 5, 1 Feb-30 Apr 61, by G. I. Cohn and E. W. Weber. 30 Apr 61, 55p.
(Contract DA 36-039-sc-78342)
Unclassified report

DESCRIPTORS: *Radiofrequency filters, *Intermediate frequency transformers, Sidebands, Synthesis, Functions, Polynomials, Low pass filters, *Band pass filters, High pass filters, Transformations (Mathematics), Matrix algebra, Numerical methods and procedures, *Electronic circuits.

The study and development of precision RF filters was continued. An approach to network synthesis that differs from the conventional low pass-band pass transformation method is presented. The approach is to determine a circuit configuration known to be capable of producing a suitable approximation to the desired response. This network determines the nature of the rational function transfer function. An approximation method is presented which determines the coefficients of this rational function. From these coefficients, the element values of the network are determined. The entire design procedure can be programmed on a digital computer. The approximation method is presented in detail. The general forms of the transmission matrix elements of ladder networks with up to 21 branches in terms of the branch impedances and admittances are included. (Author)

AD-260 064 Div. 8, 25
(21 July 61) OTS price $10.50

Sylvania Electric Products, Inc., Waltham, Mass.
NON-LOCAL ELECTRODYNAMICAL MODEL FOR EXTREMELY LOW FREQUENCY PROPAGATION IN THE UPPER IONOSPHERE.
Final rept.,
by Arnold Cantor, Julian Keilson, and Stanley Schneider. 14 Mar 61, 126p. incl. illus.
(Rept. no. F477-1)
(Contract AF 19(604)7228)
(AFCRL-302) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Extremely low frequency, *Ionospheric propagation, Ionosphere, Magnetic field, Radio signals, Gases, Ionization, Plasma physics, Mathematical analysis, Differential equations, Numerical analysis, *Plasma oscillations, Very low frequency.

A linear non-local electrodynamical model for low frequency electromagnetic propagation in the upper ionosphere is presented. Particle kinetics are treated by means of a Boltzmann-like equation for the velocity distributions. Close collisions of charged particles with neutral molecules in the slightly ionized atmosphere are treated by means of Fokker-Planck operators with separate collision frequencies and diffusion coefficients for each species of the plasma. The particle kinetics are eliminated from the coupled Maxwell-Boltzmann equations (including a constant magnetic field) and the resulting electrodynamical equations are studied by transform methods. Dispersion relations for small amplitude plane-wave solutions in the infinite homogeneous equilibrium system are analyzed for the VLF and ELF frequency ranges in the ionosphere. Excitation problems for localized impulse sources are treated in various temperature ranges and for special magnetic field conditions. The general analytic properties of the non-local dielectric functions are studied at finite temperatures by a general spectral form method. (Author)

AD-260 092 Div. 8
(1 Aug 61) OTS price $5.60

Microwave Associates, Inc., Burlington, Mass.
PHASE SHIFTER. STUDY PROGRAM (NON-FERRITE).
Quarterly progress rept. no. 4, 1 Apr-30 June 61.

by Kenneth E. Mortenson and Charles Howell.
July 61, 52p. incl. illus.
(Contract NObsr-81470)

Unclassified report

DESCRIPTORS: *Phase shifters, Microwave equipment, *Semiconductors, L-band, Diodes, Electronic circuits, Electronic scanners.

Two general phase-shifting techniques were investigated, both of which employ semiconductor elements. The first approach is the step or incremental phase-shifting device which provides for discrete changes in phase. The second phase-shifting approach is a continuously variable one which provides for a greater flexibility in phase control. Both the semiconductor material and the circuit problems involved in each of these 2 approaches were further explored. The present study results indicate that both the desired phase-shifting characteristics as well as power-handling capabilities can be reached. Phase shifters have now been built for L-band which, for the incremental type, can handle peak powers in excess of 10 kw, and for the continuous type can handle 1 kw peak power. (Author)

AD-260 097 Div. 8, 26
(25 July 61) OTS price $11.50

DuMont, Allen B., Labs. Div., Fairchild Camera and Instrument Corp., Clifton, N. J.
INDUSTRIAL PREPAREDNESS STUDY FOR DIRECT VIEWING STORAGE TUBES. TUBE TYPES: K1878 AND K1895. (VOLUME I).
Completion rept. for Step I, June 56-Mar 60, by J. Herschel and V. Le Gendre. Mar 60, 153p. incl. illus.
(Contract DA 36-039-sc-72717)

Unclassified report

DESCRIPTORS: *Storage tubes, Design, *Manufacturing methods, Tests, *Cathode ray tubes, Cathode ray tube screens, Electron guns, Glass, Vacuum pumps, Test equipment, Quality control, Specifications.

AD-260 098 Div. 8, 26
(25 July 61) OTS price $7.60

DuMont, Allen B., Labs. Div., Fairchild Camera and Instrument Corp., Clifton, N. J.
INDUSTRIAL PREPAREDNESS STUDY FOR DIRECT VIEWING STORAGE TUBES. TUBE TYPES: K1878 AND K1895. (VOLUME II).
Completion rept. for Step I, June 56-Mar 60, by J. Herschel and V. Le Gendre. Mar 60, 73p. incl. illus.
(Contract DA 36-039-sc-72717)

Unclassified report

DESCRIPTORS: *Storage tubes, Design, *Manufacturing methods, Tests, *Cathode ray tubes, Specifications, Electron tubes.

AD-260 111 Div. 8
(25 July 61) OTS price $4.60

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER CAPABILITIES OF WAVEGUIDE SYSTEMS.
Quarterly progress rept. no. 1, 1 Feb-30 Apr 61, by Meyer Gilden. 12 June 61, 48p. incl. illus. table.
(Contract NObsr-85190)

Unclassified report

DESCRIPTORS: Handbooks, *Waveguides, Microwaves, Electric fields, Propagation, Harmonic analysis, Attenuation, Air, Gases, Pressure, Surface properties, Surface temperatures, Waveguide bends, Waveguide filters, Waveguide irises, Waveguide joints, Waveguide windows, Design.

Research is concerned with the various effects in waveguide systems which lead to failures at ultra-high power levels where high averages as well as high peak power become limiting factors. Ultimately a handbook will be prepared to serve as a guide for systems engineers. Subjects discussed include: (1) breakdown in non-uniform fields which result from waveguide discontinuities and the nature of the propagating modes, (2) properties of gases other than air, and (3) heating of the waveguide and resulting deleterious effects. Some preliminary experiments on breakdown and high average power effects are presented. (Author)

AD-260 112 Div. 8, 5
(24 July 61) OTS price $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
SOME PRINCIPLES OF LOW-NOISE ANTENNA DESIGN.
Final engineering rept., vol. 1, 1 Dec 59-30 Nov 60, on Investigation of Low-Noise Antenna Systems,
by Ross Caldecott. 1 Dec 60, 45p. incl. illus. table (Rept. no. 1041-1)
(Contract AF 19(604)6134)
(AFCRL-384, vol. 1)

Unclassified report

DESCRIPTORS: *Antennas, *Noise (Radio), Reduction, Radio receivers, *Radio communication systems, Signal-to-noise ratio, Temperature, Thermal radiation, Measurement, *Parabolic antennas, *Coupled antennas, Antenna radiation patterns, Design, Tests, *Radiometers, X band, Tracking, Transmission lines, *Microwave communication systems, Mathematical analysis, Preamplifiers, Sources.

The principal sources of antenna noise are discussed together with their effects on antenna performance and methods of reducing these effects. The concept of antenna gain-temperature ratio is introduced and a mathematical method of handling it as a single design parameter evolved. Some limitations of very large continuous apertures are considered and a multielement system proposed as a means of increasing the useful size of large antennas. Some experiments to determine the feasibility of such a system and the optimum size of its elements are described. (Author)

AD-260 114 Div. 8, 26
(25 July 61) OTS price $9.10

RCA Defense Electronic Products, Camden, N. J.
DEVELOPMENT OF DIODE MICROELEMENTS.
Formal engineering rept. on Micro-Module Production Program.
17 Mar 58, 101p. incl. illus. tables.
(Contract DA 36-039-sc-75968)

Unclassified report

DESCRIPTORS: *Diodes, Semiconductors, *Subminiature electronic equipment, Electron tubes, Germanium, Silicon, Variable capacitors, Computers, *Manufacturing methods, Electrical

properties, Mechanical properties, Tests, Design, Reliability, Seals, Production, Life expectancy, Specifications.

The task of preparing diodes to meet the objectives of the Micro-Module Program was centered around four basic diode types: general-purpose germanium diodes (F-1), diffused silicon computer diodes (F-2), silicon junction zener diodes (G), and silicon-alloy variable-capacitance diodes (H). Specifications were prepared for each group, delineating the electrical, mechanical and enviornmental performance requirements necessary for a complete evaluation of the diodes. The F-1 diodes were constructed by bonding a fine gold wire to a germanium pellet. The pellet was cleaned and the junction coated with a protective silicone resin. The device was then mounted on the metallized ceramic wafer and soldered to a metal cap. Following this, the top cap was ultrasonically sealed, providing the second diode electrode. The diode microelement was then tested for hermeticity, and aged and inspected for electrical and mechanical properties. Prototype and final-grade F-2, silicon diffused diodes featured a surface passivation treatment. The F-2 diode program was completed satisfactorily. The F-2 and Group H diodes were processed from silicon pellets. After the processes of bonding the leads and baking, the pellets were subjected to surface-passivating treatment and high-temperature aging. The diodes were then mounted on metallized wafers and the electrical and mechanical properties of the devices were determined. The preparation of type G regulator diodes was discontinued. (Author)

AD-260 116 Div. 8, 26
(25 July 61) OTS price $10.50

RCA Defense Electronic Products, Camden, N. J.
DEVELOPMENT OF CAPACITOR MICROELEMENTS.
Formal engineering rept. on Micro-Module Production Program.
17 Mar 58, 140p. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: Capacitors, *Subminiature electronic equipment, *Ceramic capacitors, *Electrolytic capacitors, *Tantalum capacitors, *Manufacturing methods, Reliability, Production, Thin films, Design, Tests, Dielectric films, Life expectancy, Electrical properties.

Research was concerned with the design and production of preliminary, prototype, and final-grade capacitor microelements of various types. General-purpose; precision, temperature-compensating ceramic capacitors; and tantalum electrolytic capacitors were required to meet specific micro-module needs, including ranges of values, working voltages, reliability characteristics, and other specifications applicable to conventional capacitors. Ceramic capacitors of single-layer and multilayered thin-film ceramic dielectrics were produced. Monolithic structures of layered thin film were employed to reduce thickness and achieve higher capacitance ranges. Nominal capacitance values from approximately 5 micromicrofarads to 0.005 microfarads including both general-purpose and precision types, were obtained in 0.010-inch-thick layer construction. For the multilayer ceramic capacitors, nominal capacitance values ranging from approximately 30 micromicrofarads to 0.3 microfarads were obtained in general-purpose and precision types. Over 3800 final-grade elements were fabricated and tested. More than 2000 tantalum-electrolytic capacitor microelements were also produced. (Author)

AD-260 136 Div. 8, 6
(26 July 61) OTS price $1.60

Sylvania Electric Products, Inc., Waltham, Mass.
MICROWAVE BEAM-STEERING TECHNIQUES,
20 May 61, 22p. incl. illus. (Technical note no. TN 480-4)
(Contract AF 30(602)2280, Proj. 4506)
(RADC TN 61-104) Unclassified report

DESCRIPTORS: Microwave equipment, *Delay lines, *Radar antennas, Antennas, Phase measurement, Radar equipment, Phase shifters, L band, S band, C band, *Microwave oscillators, Oscillators, Radar signals, Calibration, Design, Tests, Standing wave ratios.

Research was continued in the development of a delay line technique capable of electronically phasing elements of steerable radar antenna arrays. The system consists of a double-fed delay line having thirty phase-controllable outputs. The phase relationship of these output signals is controlled by a variable frequency oscillator. Fabrication and tests of all modules, mixers and the main delay line were completed. Assembly and initial calibration of the entire delay line system was also completed, together with an investigation of the phase characteristics of the sum mixers. (Author)

AD-260 162 Div. 8
(26 July 61) OTS price $2.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
MICROWAVE TRANSMISSION SYSTEM.
Quarterly progress rept. no. 3, 1 Mar-31 May 61, by Paul F. Mohrbach, Robert R. Robinson and Charles L. Stonecypher. 31 May 61, 21p. incl. illus. (Rept. no. Q-A2453-3)
(Contract N178-7755)
Unclassified report

DESCRIPTORS: *Microwaves, *Wave transmission, Radiofrequency power, *Radiofrequency attenuators, Attenuation, Radar transmitters, Radio transmitters, Microwave equipment, Magnetrons, Anechoic chambers, Antenna horns, Tuning devices, Design, Transmission lines, Test equipment, Sources, Radiofrequency generators, X band, Tests, Cooling.

Construction is described of a 250 watt power source to operate in the 1-10 gc range. Operating in conjunction with this power source is an attenuation system providing output power from the milliwatt range to approximately half the total transmitter power. Attenuation over the 3.0 to 10 gc range is accomplished by radiating the full power of the transmitter into an anechoic chamber and intercepting the desired output level with a receiving antenna. Commercial attenuation techniques will be used for the lower frequencies since the size of the antennas is prohibitive at these frequencies. The transmitting and attenuating system was tested at 10 gc and it performed as expected. (Author)

AD-260 230 Div. 8, 6,
(27 July 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE USE OF PULSE CODING TO DISCRIMINATE AGAINST CLUTTER,
by Roger Manasse. 7 June 61, 16p. incl. illus.
(Group rept. no. 312-12, rev. 1)
(Contract AF 19(604)7400)
Unclassified report

Presented at the Pulse Compression Symposium, Rome Air Development Center, June 25-26, 1957.

DESCRIPTORS: *Search radar, *Communications theory, Detection, Radar targets, Electromagnetic wave reflections, *Noise (Radar), Radar signals, Amplitude modulation, Radiofrequency filters, Coding, *Correlation techniques, *Pulse modulation.

The use of pulse coding (or pulse comprehension) in radar to obtain improved detection of targets in clutter is discussed. The effectiveness of this technique depends on the differing spatial characteristics of the target and clutter in contrast with the usual MTI which depends on the differing time-varying properties. With the assumptions of a simple clutter model and an appropriately optimized receiver, and with the aid of known results in detection theory, an expression is derived for the single-pulse detection capability of a radar operating in the presence of both clutter and additive white receiver noise. From the expression it is seen that detection performance is simply related to the spectrum of the transmitted signal and, generally speaking, improves as the bandwidth of the transmitted signal is increased. Results for clutter noise only or receiver noise only appear as special cases. (Author)

AD-260 232 Div. 8
(27 July 61) OTS price $8.10

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
CLASSIFICATION DECISIONS IN PATTERN RECOGNITION,
by George S. Sebestyen. 25 Apr 60, 79p. incl. illus. (Technical rept. no. 381)
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000; In cooperation with Melpar, Inc., Watertown, Mass., Contract AF 30(602)2112)
Unclassified report

DESCRIPTORS: *Communications theory, Classification, Identification, Diagnosis, Mathematical analysis, Transformations (Mathematics), Probability, Vector analysis, Matrix algebra, Integrals, Electrical networks, Cybernetics.

The basic element in the solution of pattern-recognition problems is the requirement for the ability to recognize membership in classes. This report considers the automatic establishment of decision criteria for measuring membership in classes that are known only from a finite set of samples. Each sample is represented by a point in a suitably chosen, finite-dimensional vector space in which a class corresponds to a domain that contains its samples. Boundaries of the domain in the vector space can be expressed analytically with the aid of transformations that cluster samples of a class and separate classes from one another. From these geometrical notions a generalized discriminant analysis is developed which, as the sample size goes to infinity, leads to decision-making that is consistent with the results of statistical decision theory. A number of special cases of varying complexity are worked out. These differ from one another partly in the manner in which the operation of clustering samples of a class and the separation of classes is formulated as a mathematical problem, and partly in the complexity of transformations of the vector space which is permitted during the solution of the problem. (Author)

AD-260 244 Div. 8
(27 July 61) OTS price $6.60

Stanford Research Inst., Menlo Park, Calif.
A VARIATIONAL METHOD OF SYNTHESIZING ANTENNA POWER PATTERNS,
by Edward K. Proctor and Clarence M. Ablow. Mar 61, 51p. incl. illus. (Scientific rept. no. 9)
(Contract AF 19(604)3502)
(AFCRL-387) Unclassified report

DESCRIPTORS: *Antennas, *Antenna radiation patterns, Integral transforms, Electromagnetic fields, Numerical analysis, Digital computers, Synthesis, Electromagnetic theory, Partial differential equations, Differential equations, Tests.

A variational approach is developed by means of which both the phase and the amplitude of an antenna excitation function that approximates a prescribed far-field power pattern can be determined. No information concerning the phase of the prescribed pattern need be supplied. The resultant pattern will be an optimum approximation in a mean-square sense and the excitation function will be the smoothest one possible under the prescribed circumstances. The relative importances of the pattern fit and the smoothness of the excitation function can be adjusted by means of weighting factors. The width of the radiating aperture appears as an explicit parameter of the synthesis procedure so that trade-offs between aperture size, pattern error, and smoothness of excitation function may easily be examined. In particular, this latter feature will make possible an explicit determination of the relationship between a given amount of super-gain and the resulting fluctuation of the excitation function in the radiating aperture. The smoothness requirement also has the effect of achieving the highest possible aperture efficiency consistent with the allowable pattern error. A numerical procedure whereby the necessary computations can be performed on a digital computer of only moderate speed and capacity is described. (Author)

AD-260 245 Div. 8
(27 July 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
A DIELECTRIC-LOADED LEAKY-WAVE ANTENNA,
by J. Aasted and R. C. Honey. Mar 61, 41p. incl. illus. tables (Scientific rept. no. 8)
(Contract AF 19(604)3502)
(AFCRL-379) Unclassified report

DESCRIPTORS: *Antennas, Dielectrics, Antenna radiation patterns, *Conical antennas, Design, *Transmission wines, *Waveguides, Antenna horns, Superhigh frequency, Resonance, Resins, Digital computers, Mathematical analysis.

The design and the measured performance are described of a flat, leaky-wave antenna in which the inductive, leaky surface is backed with a slab of dielectric. The analysis is based on a transverse resonance analysis which determines the physical dimensions of the antenna for a certain specified aperture distribution. An antenna was built to compare the theoretical behavior with the measured performance. Two ways of forming the dielectric to the antenna were tested. When the dielectric was molded in place the radiation pattern agreed very well with the theoretically predicted pattern, but high losses in the casting resin gave a lower gain for the

antenna than anticipated. For a machined piece of dielectric, the radiation pattern was not as close to the predicted pattern as for the molded sample, but the gain was close to the predicted value. The antenna consists of a 28-by-18-inch through filled with a dielectric material over which a sheet of parallel wires is strung. At the design frequency, 4.75 gc, the antenna radiates a pencil beam 9.4 by 8.3 degrees wide at an angle of 54 degrees measured from the normal to the inductive surface. The beam can be scanned from approximately 75 degrees down to 12 degrees from the normal to the aperture by changing the frequency from 5.25 gc to 4.20 gc. (Author)

AD-260 246 Div. 8
(27 July 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
RIDGE WAVEGUIDE DIRECTIONAL COUPLERS,
by W. J. Getsinger. May 61, 36p. incl. illus. 24 refs. (Scientific rept. no. 7)
(Contract AF 19(604)3502)
(AFCRL-393) Unclassified report

DESCRIPTORS: *Waveguides, *Waveguide couplers, Countermeasures, Broadband, Theory, Transmission lines, Partial differential equations, Design, Attenuation, Propagation, Mathematical analysis, Electromagnetic waves.

An approximate determination of the dominant-mode fields in ridge waveguides at all frequencies was made. Evaluations of the fields along the walls of a commercially standard single-ridge guide having a usable frequency range from 3.75 to 15.0 gc, and a commercially standard double-ridge guide having a usable frequency range from 4.7 to 11.0 gc were carried out, and graphs drawn so that the results could be applied in practical situations. Using Bethe's small-aperture theory, design formulas were developed for simple cross-guide directional couplers in both single- and double-ridge guide. These formulas and the field-graphs were used to design and construct two cross-guide couplers. Design formulas were developed for multi-hole, broad-wall coupled ridge-waveguide directional couplers. The coupling for the single-ridge broad-wall coupler ranged between about 22 and 29 db over the 3.75 to 15.0 gc band. The coupling for the double-ridge broad-wall coupler was between 26 and 33 db over the 4.7 to 11.0 gc range. (Author)

AD-260 247 Div. 8, 6
(27 July 61) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
ECM ANTENNAS AND COMPONENTS FOR MISSILES AND SPACE VEHICLES.
Final rept. 16 July 58-15 June 61,
by W. J. Getsinger. Apr 61, 17p. 12 refs.
(Contract AF 19(604)3502)
(AFCRL-388) Unclassified report

DESCRIPTORS: Guided missiles, *Spaceships, *Countermeasures, *Antennas, *Guided missile antennas, Electronic equipment, *Satellite vehicle antennas, Antenna radiation patterns, Waveguides, Dipole antennas, Antenna couplers, Satellite vehicles, Airborne, *Slot antennas.

Investigations were made in an effort to develop new information on antenna systems that eventually might be useful for Air Force ECM systems. The theoretical investigations of surface-wave antennas and leaky-wave antennas are considered first, followed by discussion of a technique for determining the smoothest aperture distribution that will give a specified radiation pattern for any large aperture antenna. Next, a number of different antennas designed on a leaky-wave basis are considered, followed by a discussion of other types of antennas, including frequency-independent-types. Finally, ridge-waveguide directional couplers, which can be very useful in ECM antenna systems, are considered. (Author)

AD-260 249 Div. 8
(27 July 61) OTS price $1.60

Scanwell Labs., Inc., Springfield, Va.
HIGH SPEED, HIGH POWER S-BAND PHASE SHIFTER.
Interim development rept. 30 Sep-31 Dec 60,
by Frederick Fine. 31 Dec 60, 15p. incl. illus.
(Contract NObsr-81265, Proj. SR-00R0302, ST-134)
Unclassified report

DESCRIPTORS: *Phase shifters, Standing wave ratios, Radar equipment, Measurement, Design, Impedance, Attenuation, S band, Radar equipment, Impedance matching.

A description of a new model phase shifter is given with accompanying test results. The problems of moding and poor RF contact were eliminated by reducing the radial dimensions of the cavity structures and changing the mechanical design. Matching of the device, by adjusting the dimensions of the feed structure and end fins, reduced the VSWR considerably. The matching resulted in a more linear phase shift curve and lowered the attenuation. By matching the device closer to its cutoff frequency, less movement of the fin structure is necessary to obtain any particular value of phase shift. (Author)

AD-260 272 Div. 8, 2
(28 July 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
RECIPROCITY OF REFLECTION COEFFICIENT FOR A SHARPLY BOUNDED IONOSPHERE,
by T. Birmingham. Mar 60, 18p. incl. illus. tables (Rept. no. AFCRL-145)
Unclassified report

DESCRIPTORS: Ionosphere, *Electromagnetic waves, Wave transmission, *Terrestrial magnetism, *Reflection, Very low frequency, Periodical variations, *Ionospheric propagation.

Numerous studies were made of the reciprocity of very low frequency electromagnetic transmissions in the presence of an externally applied magnetic field, specifically the earth's magnetic field. This analysis examines very low frequency reflections from the ionosphere in the presence of a transverse magnetic field and shows that theoretically, in the case of east-west and west-east propagation in the presence of a transverse applied magnetic field, nonreciprocity of the reflection coefficient exists. Assuming that the reflection coefficient and attenuation factor are in inverse proportion, if west-east propagation has a higher reflectivity, its attenuation factor is correspondingly less. (Author)

AD-260 274 Div. 8, 1, 5
(28 July 61) OTS price $13.50

Boeing Co., Seattle, Wash.
DESIGN STUDY FOR EXPERIMENTAL AIRBORNE ANTENNA

FOR KC-135 AIRCRAFT.
Final engineering rept.,
by A. Andermann, Luis L. Oh and C. D. Lunden.
14 Feb 61, 19p. incl. illus. tables (Document no. D6-7190)
(Contract AF 19(604)7373)
(AFCRL-67)

Unclassified report

DESCRIPTORS: *Transport planes, *Jet planes, *Microwave equipment, *Antennas, *Radio communication systems, Satellite vehicles, Design, *Radio relay systems, Noise (Radio), Radio transmitters, Radio receivers, Control systems, Airframes, Installation, Radomes, Aerodynamics, Cooling, Mechanical drives, Computers, Electrical equipment, Mounting brackets, Airborne, Communication equipment, *Microwave communication systems.

The result of a design study of a microwave antenna system for the Boeing KC-135 aircraft is presented. The antenna is an upward-looking, steerable, high-gain antenna for very-long-range, two-way communications, using signals relayed by satellites (active or passive) or scattered by belts of orbiting chaff. Critical antenna design problems connected with the very-high average transmitter power and the very-low receiver noise figure are considered in detail.

AD-260 281 Div. 8, 23, 31
(28 July 61) OTS price $3.60

Navy Electronics Lab., San Diego, Calif.
CURRENT TRENDS IN NAVAL ELECTRONICS MAINTENANCE.
Rept. for Oct 59-Feb 60,
by F. W. Smith and K. R. Murch. 20 Sep 60, 38p. incl. illus. tables, 20 refs. (NEL rept. no. 972)

Unclassified report

DESCRIPTORS: *Electronic equipment, *Maintenance, Shipborne, *Naval personnel, Military requirements, Training, Military training, Effectiveness, Scientific personnel, *Maintenance personnel, Data processing systems, *Radar equipment, *Communication equipment, *Cruisers, *Job analysis.

A survey was made of maintenance trends and problems on board USS GALVESTON (CLG 3). This information was collated with previous publications. It was concluded that in large systems, maintenance personnel should be trained as specialists, rather than as general purpose technicians; that maintainability design for such systems be considered early in research and development stages; that equipment built for the Navy be maintainable by Navy technicians; and that a variety of problem areas be investigated. (Author)

AD-260 292 Div. 8
(28 July 61) OTS price $2.60

Navy Electronics Lab., San Diego, Calif.
PRACTICAL MATCHING TECHNIQUES ON THE SMITH CHART.
Research rept. for 1960,
by Ove Simonsen. 31 Mar 61, 29p. incl. illus. tables (NEL rept. no. 1039)

Unclassified report

DESCRIPTORS: *Antennas, Broadband, Transmission lines, *Impedance matching, Impedance, Admittance, Measurement, Standing wave ratios, Transformers.

The investigation was concerned with the techniques used with the Smith Chart when developing matching networks for broadband antennas. The basic problems involved in the application of these techniques are covered in detail, with illustrations showing each step on the Smith Chart. These various problems concern the matching of broadband antennas although this does not indicate that the chart techniques apply to such cases only. They are adapted to single frequency antennas as well. The only difference is that the problems then become considerably simpler and, instead of striving for a 3:1 standing wave ratio, one settles for nothing less than a 1:1. A problem of this type is included, because it is felt that, after the techniques are mastered with broadband antennas, the procedure for obtaining a match for a single frequency antenna will suggest itself. (Author)

AD-260 296 Div. 8, 25
(28 July 61) OTS price $1.60

Navy Electronics Lab., San Diego, Calif.
STUDY OF VLF CORONA.
Research rept. for 20 June-2 Sep 60,
by J. H. Smith and W. E. Gustafson. 4 May 61, 20p. incl. illus. (NEL rept. no. 1044)

Unclassified report

DESCRIPTORS: *Electrical corona, *Conductors, Voltage, Very low frequency, Measurement, Test methods, Low frequency, Test equipment, Copper wire, Steel wire, Copper coatings, Antennas, Radio transmitters, Voltmeters, Electrical conductance, *Electromagnetic properties.

A few experiments were made in the VLF range using 2 conductors under dry and wet conditions and with the conductor surfaces both normal and roughened. For the dry conductors, corona appeared at about 25 and 48 kv, respectively, for No. 16 solid, tinned copper wire and for 7-strand No. 14 copperclad steel wire. Extension to the VLF range of existent formulas for computing corona voltage at power frequencies led to values in reasonable agreement with experimental results. Formulas for predicting the effects of roughness and wetness overestimated the effects. Variation of frequency within the VLF range appeared to have no effect on the corona-incidence voltage. (Author)

AD-260 305 Div. 8, 25
(28 July 61) OTS price $3.60

RCA Victor Co., Ltd. (Canada).
TRANSMISSION AND REFLECTION OF ELECTROMAGNETIC WAVES AT A PLASMA BOUNDARY FOR ARBITRARY ANGLES OF INCIDENCE,
by K. Graf and M. P. Bachynski. Mar 61, 35p.
(Scientific rept. no. 1; Research rept. no. 7-801,11)
(Contract AF 19(604)7291)
(AFCRL-378)

Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Electromagnetic wave reflections, *Plasma physics, Propagation, *Wave transmission, Radio transmission, *Reflection.

The interaction of a plane electromagnetic wave with a flat freespace-plasma interface has been considered for arbitrary angles of incidence. When a uniform, isotropic plasma is described

by a complex dielectric coefficient, phase and attenuation constants for the waves in the plasma are functions of the dielectric coefficient and the angle of incidence. The plasma can support independent horizontally and vertically polarized waves. Expressions and graphical representations are given showing the amount of energy reflected and refracted at the interface as a function of angle of incidence and plasma parameters. The vertically polarized case shows a maximum in the energy entering the plasma at the Brewster angle. Lines of constant Brewster angle appear as concentric curves centered on the origin of the complex dielectric coefficient plane. The elliptical polarization of a plane wave reflected from the interface, when a wave with equal horizontally and vertically polarized components is incident on the interface, suggests the similarity of lossless plasmas to ordinary dielectrics and of lossy plasmas to metals. (Author)

AD-260 332 Div. 8
(31 July 61) OTS price $4.60

Boeing Co., Seattle, Wash.
THE DOMINANT CUTOFF WAVELENGTH OF A LUNAR LINE,
by Ann Y. Hu and Akira Ishimaru. Feb 61, 43p. incl. illus. tables (Rept. no. D6-7467; Technical rept. no. 1; Scientific rept. no. 1)
(Contract AF 19(604)6189)
(AFCRL-133) Unclassified report

DESCRIPTORS: *Microwave equipment, *Transmission lines, Waveguides, Integral equations, Bessel functions, Numerical analysis, Tests, Mathematical analysis.

A method is presented for calculating the lowest cut-off wavelength of a new microwave transmission line, lunar line, which is formed by 2 eccentric circular metal tubes, connected with a metal bar or tangential to each other. The lunar-shaped cross section is approximated by introducing a series of steps in the outer guide wall and is divided into m fan-shape regions. The solution of this multiple-step waveguide is carried out by introducing the parameter alpha sub i for individual regions. The radial boundary conditions require a combination of Bessel's functions of non-integer order for each region. The common boundaries between regions give m integral equations. These integral equations are solved by assuming an electric field at the common boundary. The solution of the m-stepped waveguide results in a system of 2 m equations containing beta sub c, rho sub i, and alpha sub i, 2 m unknowns. A successive approximation method is applied to obtain the cut-off wavelength. The calculated value is in close agreement with experimental results. (Author)

AD-260 346 Div. 8
(31 July 61) OTS price $1.60

California U., Berkeley.
REFLECTION AND TRANSMISSION OF A PLANE WAVE BY A FLAT CLOUD,
by Edmund Pinney. June 61, 16p. (Technical rept. no. 2)
(Contract Nonr-22204, Proj. NR 340-040)
Unclassified report

DESCRIPTORS: *Sheets, *Electromagnetic waves, Propagation, Reflection, *Wave transmission, Electrical conductance, Electromagnetic fields, Mathematical analysis, Clouds, Spheres, Atmosphere models.

The cloud in question is an infinite slab bounded by two parallel planes. It consists of minute spheres whose diameters are very small compared to the wave length and whose total volume is very small compared to the volume of space occupied by the cloud. Results show that the cloud behaves like a slightly lossy dielectric slab. The energy impinging upon it is partly reflected, partly transmitted through the cloud, and partly converted into heat inside the cloud. For a cloud many wave lengths thick, little energy is transmitted through. (Author)

AD-260 350 Div. 8
(31 July 61) OTS price $9.10

Dorne and Margolin Inc., Westbury, N. Y.
STUDY OF BROADBAND SEARCH ANTENNAS FOR ECM APPLICATIONS.
Final rept.,
by Julius Kane and Michael J. Rodriguez. Mar 61, 106p. incl. illus. (Rept. no. 805.6)
(Contract AF 19(604)5463)
(AFCRL-182) Unclassified report

DESCRIPTORS: *Slot antennas, Antennas, *Broadband, Design, Countermeasures, Mathematical analysis, Impedance, Transmission lines, *Conical antennas, *Helical antennas, Antenna radiation patterns.

Two long-slot antennas are described both of which efficiently utilize their apertures over an extended frequency range of at least 10:1. One antenna utilizes a tapered feed which performs the dual function of acting as feed and enclosure. This results in broadband operation with a simple structure having a large configuration. The other makes use of a multiple-point feed and a novel backing structure. This latter antenna is considerably smaller in size than the former, although a more complex backing cavity structure is required. Experimental data are presented which demonstrate the wide-band characteristics of a long-slot antenna excited by either a tapered-feed or a multiple-feed structure. The analysis and design of a novel wide-band backing cavity for the long-slot antenna is also discussed. (Author)

AD-260 351 Div. 8
(31 July 61) OTS price $5.60

Weston Instruments, Div. of Daystrom, Inc., Newark, N. J.
VARIABLE PRECISION METAL-FILM RESISTORS.
Interim development rept. on Phase 1 for 1 Oct 60-30 June 61.
1 July 61, 56p. incl. illus. tables.
(Contract NObsr-77548)
Unclassified report

DESCRIPTORS: Metal films, *Potentiometers, *Variable resistors, Resistance, Cermets, Resistors, Measurement, Design, Tests.

Research was continued on the development of variable metal-film resistors. Work on a multiturn, metal-film trimmer resistor was conducted. Achievement of the proper wear rate of 0.67 x 10 to the -6 power/Cycle unloaded and 4 x 10 to the -6 power/Cycle loaded was consistent. Peak noise values were in excess of the 200 ohms desired, but nominal values were within the desired range. Fabrication of all parts except final contractors and resistive

elements was completed. The linearity adjustment apparatus was set up. A new cycler was designed, fabricated, and put into use on series 200 testing. Limited environmental studies (high temperature exposure, load life, vibration, temperature coefficient, torque) were undertaken. (Author)

AD-260 356 Div. 8, 7
(31 July 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
CROSSED-FIELD THERMIONIC CONVERSION,
by P. H. Peters. Mar 61, 34p. incl. illus. 11 refs. (Scientific rept. no. 10)
(Contract AF 19(604)5472)
(AFCRL-401) Unclassified report

DESCRIPTORS: Electron beams, *Thermionic emission, *Power supplies, Electric fields, Generators, Magnetic fields, Effectiveness, Diodes, Electrodes, Electric currents, Voltage, Design, Electromagnetic fields, Anodes, Cathodes.

Research was concerned with the use of an electron beam of the crossed-field type in a thermionic energy converter having three electrodes; an emitter, a collector, and a beam-forming anode. The electric field above the emitter is created by an auxilliary voltage source rather than by an inter-electrode contact potential. This voltage may be made as high as is necessary to accelerate electrons from the emitter surface. The emitter-anode spacing may be made larger than is used in a vacuum diode converter. Generated power is derived from electron flow across the emitter-collector contact potential. It was found that a virtual cathode forms above the collector electrode and prevents the collection of current at low voltage. Strong beam-focusing by the magnetic field also causes the virtual cathode to form at low levels of transferred current. Further effort and study are required to solve problems of orbit control in the collector region. A crossed-field converter requires both a magnet and an external high-voltage supply. Its relative complexity offsets its few advantages. (Author)

AD-260 360 Div. 8, 25
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
POTENTIAL DISTRIBUTIONS IN A LOW PRESSURE THERMIONIC CONVERTER,
by P. L. Auer. July 60, 25p. incl. illus. table. (Scientific rept. no. 4)
(Contract AF 19(604)5472)
(AFCRL-282) Unclassified report

DESCRIPTORS: *Diodes, *Electric potential, *Cesium, Cesium electron tubes, *Thermionic emission, Cathodes, *Space charges, Electric power production, Vapors, Ions, Ionization, Vacuum systems.

A planar diode model of a low pressure cesium filled thermionic converter is treated. It is assumed that all ions and electrons are created at the surface of the hot cathode with a Maxwellian distribution corresponding to the cathode temperature. The charge species are then assumed to move through the plasma consisting of electrons, ions, and neutral cesium atoms as free particles under the influence of their mutual space charge field. A method is outlined by which the potential distributions corresponding to different operating conditions may be calculated completely. In this fashion the operating characteristics of the converter may be related to the self-consistent space charge potentials. Instabilities as possible sources of tube oscillations are briefly discussed. (Author)

AD-260 361 Div. 8, 25
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
CESIUM ION NEUTRALIZATION OF THERMIONIC CONVERTERS,
by J. M. Houston and M. D. Gibbons. Mar 61, 21p. incl. illus. (Scientific rept. no. 5)
(Contract AF 19(604)5472)
(AFCRL-283) Unclassified report

DESCRIPTORS: *Diodes, *Electric potential, Electric power production, *Space charges, *Cesium, Vapors, *Thermionic emission, Ions, Ionization, Cesium electron tubes, Vacuum systems.

The thermionic diode is being investigated as a heat-to-electricity converter. Cesium vapor is often introduced into such a diode in order to form the ions needed for neutralizing electron space charge. A simple model of ion neutralization is assumed in which all ions are created by surface ionization at the hot cathode surface. Calculations are made of the values of cathode work function and temperature where Cs ion neutralization of a diode can exist. Experimental results in reasonable agreement with the calculations are presented. (Author)

AD-260 363 Div. 8, 14
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
A TITANIUM MATCHING SILICA-FREE CERAMIC,
by J. G. Leschen. Mar 61, 25p. incl. illus. 11 refs. (Scientific rept. no. 7)
(Contract AF 19(604)5472)
(AFCRL-298) Unclassified report

DESCRIPTORS: *Electron tubes, Materials, *Titanium, *Ceramic materials, Thermal expansion, Aluminum compounds, Magnesium compounds, Oxides, Spinel, Processing, *Diodes, Oxide cathodes, Chlorines, Contamination.

A method was developed for processing a silica-free vacuum-tight ceramic with a thermal expansion matching that of titanium. The ceramic is half magnesia and half ordinary spinel. The ceramic performs unsatisfactorily when used at ambient temperatures of 600 C or above in a diode with an oxide cathode. The level of electron emission from the cathode is low, apparently because of poisoning by Cl that is slowly evolved from the ceramic. Unsatisfactory performance is further reflected in unsteady diode characteristics, but this difficulty may be overcome. Performance in devices with cathodes insensitive to Cl poisoning should be more satisfactory. (Author)

AD-260 364 Div. 8, 25
(31 July 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
COMPATIBLE ALKALINE EARTH OXIDE SYSTEM FOR

VACUUM THERMIONIC CONVERTERS,
by M. D. Gibbons. Mar 61, 27p. incl. illus.
(Scientific rept. no. 8)
(Contract AF 19(604)5472)
(AFCRL-299) Unclassified report

DESCRIPTORS: *Diodes, Electrodes, Cathodes, Anodes, *Thermionic emission, *Coatings, Calcium compounds, *Alkaline earth metals, Alkaline earth compounds, *Oxides, Strontium compounds, Barium compounds.

The advantages and disadvantages are described of alkaline earth oxide systems for use as anode and cathode coatings in the vacuum converter. The coating properties used to determine the choice of the various systems are: (1) low anode work function, (2) a stable cathode capable of delivering a large emission current, (3) the anode and cathode coatings must be compatible with each other during life. These properties have led to a choice of a system consisting of a strontium calcium oxide for the cathode and a barium strontium oxide for the anode. Emission measurements and evaporation rates for strontium calcium oxide on different base metals are presented. (Author)

AD-260 365 Div. 8, 25
(31 July 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF EMISSION FROM ELECTRODE SYSTEMS IN CESIUM VAPOR,
by M. D. Gibbons. Mar 61, 36p. incl. illus.
(Scientific rept. no. 9)
(Contract AF 19(604)5472)
(AFCRL-400) Unclassified report

DESCRIPTORS: *Thermionic emission, *Electrodes, Space charges, *Tantalum, *Cesium, Cathodes, Vapor, Anodes, Cesium electron tubes, *Electron tubes, Vacuum systems.

This report describes emission measurements from various electrode systems, and some observations on hot cathode discharges in cesium vapor. Emission measurements give the boundary conditions at the electrode surfaces in the thermionic converter, and possibly give an indication of the relative bond strength of cesium to the electrode surface. The study has shown the importance of the interplay of electron space charge problems and surface ionization. The general form of the tantalum-cesium emission system has been measured. Tantalum offers a more suitable anode material for the converter than tungsten. The so-called second mode has been shown to be a hot cathode discharge. (Author)

AD-260 367 Div. 8
(31 July 61) OTS price $6.60

General Electric Co., Auburn, N. Y.
INVESTIGATIONS OF ELECTRONICALLY CONTROLLABLE TURN-OFF CONTROLLED RECTIFIER.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61,
by J. Moyson and J. Petruzella. 31 Mar 61,
63p. incl. illus. tables.
(Contract DA 36-039-sc-85062, Proj. 3A99-21-001)
Unclassified report

DESCRIPTORS: *Rectifiers, Electronic equipment, *Transistors, Manufacturing methods, Control, Silicon, Diffusion, Design, Mathematical analysis.

Research was continued on the development of electronically controllable turn-off controlled rectifiers. Considerable time was spent on turn-off devices of the more complicated PNPN-NPN structures. The results of the studies of controlled rectifier - transistor structure combinations, clearly indicates device feasibility for the case in which the controlled rectifier and the transistor maintain their respective identities throughout the operation of the device. Structures of this type were fabricated and were very successful in yielding gains up to 500. However, the case in which the standard controlled rectifier structure is altered by partially shorting the anode to the N-type base region did not give satisfactory controlled rectifier - transistor action. This was due to inherent lateral biasing effects. Devices of this type appear to be limited to turn-off gains of less than 100. (Author)

AD-260 374 Div. 8, 25
(29 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
SIGNAL CONDITIONING FOR SATELLITE BORNE ENERGETIC-CHARGED-PARTICLE EXPERIMENTS,
by George H. Ludwig. Aug 61, 19p. incl. illus. table (Technical note no. D-1080)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1080.

DESCRIPTORS: *Satellite vehicles, *Instrumentation, Airborne, Tests, Cosmic rays, Protons, Solar flares, Particles, Gas inoization, Plasma physics, Ionization chambers, Proportional counters, Geiger counters, Cloud chambers, Bubble chambers, Scintillation counters, Cerenkov radiation, Van Allen radiation belt, Radiation counters, Telemeter systems, Space probes, Data processing systems, *Radio signals.

Many of the spacecraft launched thus far have carried detectors for investigating cosmic rays, solar protons, solar plasmas, and the geomagnetically trapped radiation. These detectors, which will find continued application in the future, include ion chambers; proportional, Geiger-Muller, scintillation, Cerenkov, and solid state detectors; ion collectors; and nuclear emulsions. The instrumentation required to condition the signals from these detectors prior to telemetering is steadily growing more complex in order to permit more meaningful measurements. This report describes a number of instrumentation elements typical of the present state of the art, and a present-generation three-detector system which illustrates the integration of such basic elements into a complex system. (Author)

AD-260 375 Div. 8, 20
(31 July 61) OTS price $16.50

Hughes Aircraft Co., Culver City, Calif.
PHYSICAL PARAMETERS AFFECTING PERFORMANCE OF P-N JUNCTION DETECTORS.
Final rept.,
by Norman A. Baily, Robert J. Grainger and others.
13 Apr 61, 248p. incl. illus. 44 refs.
(Contract DA 49-146-XZ-016)
(DASA-1203) Unclassified report

DESCRIPTORS: Particles, *Semiconductors, Detectors, *Alpha particle detectors, Crystals, Beta particles, Alpha particles, Silicon, Crystal counters, *Beta ray spectrometers, Diodes, Physical properties, Electrical properties, Design, Photons, Ions, Neutrons, Neutron spectrometers, *Neutron crystal spectrometers, Radiation damage, Gamma rays, Helium, *Dosimeters, Radiation counters, Protons, Medical research.

Research was concerned with the main factors that should govern the design of diffused junction diodes which are to be used as nuclear particle detectors. The general principles of operation of the detectors are described. The performance characteristics and fabrication techniques of detectors studied are compared with the first detectors made early in 1959.

AD-260 382 Div. 8
(31 July 61) OTS price $3.60

Melabs., Palo Alto, Calif.
FERRITE DEVICES FOR RECEIVING SYSTEMS.
Quarterly progress rept. no. 5, 4 Feb-3 May 61, by R. A. Henschke, D. A. Parkes, and S. S. Shapiro. 3 May 61, 35p. incl. illus. table.
(Contract DA 36-039-sc-85296, Proj. 3-26-12-700)
Unclassified report

DESCRIPTORS: Microwave equipment, Ferrites, Broadband, *Phase shifters, *Waveguides, *Band-pass filters, Dielectrics, Radar receivers, Radio receivers, Transmission lines, Standing wave ratios, Measurement, Design, Attenuation, *Ferromagnetic materials.

Troughline isolator design problems are discussed. A stripline isolator is described which provides greater than 25 db isolation and under 1.2 db insertion loss for 4-8 kmc. A description is given of phase shift studies carried out on an axially magnetized, ferrite-loaded stripline bandpass filter. Information is given on measurements of the non-reciprocal attenuation and degradation of mode purity provided by a circumferentially magnetized ring of hexagonal ferrite material in TE01 mode waveguide. A description is also given of measurements on hexagonal ferrite materials to be used in a broadband 26.5-40 kmc isolator. (Author)

AD-260 403 Div. 8, 25
(31 July 61) OTS price $7.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
PHASE RELATIONSHIPS IN A NONLINEAR VELOCITY-MODULATED ELECTRON BEAM.
Technical rept. no. 1 on Phase Stability of Microwave Amplifiers,
by P. Engler. 31 Jan 61, 69p. incl. illus., 18 refs. (Research rept. no. EE 494)
(Contract AF 30(602)2041)
Unclassified report

DESCRIPTORS: *Electron beams, Velocity, Modulation, Differential equations, Partial differential equations, Non-linear differential equations, Polarization, Numerical analysis, Microwave amplifiers, Space charges, Plasma physics, Magnetohydrodynamics, Electrons, *Phase measurement, Magnetic fields, Klystrons, Phase shifters, Electric fields, Traveling wave tubes, Microwave frequency, Non-linear systems, Stability, Harmonic analysis.

The fundamental differential equation describing the polarization of an electron in an infinitely wide electron beam is derived. The modified fundamental differential equation is formulated into a fourth-degree non-linear partial differential equation. Terms involving the polarization raised to powers higher than the third are neglected and the remaining third-degree equation is separated into 3 linear differential equations by successive approximations. The solution to the differential equation for the first-degree polarization is substituted into the equation for the second-degree polarization to yield the driving terms of that equation. The second-degree polarization is composed of dc and first-harmonic frequency terms. The procedure is repeated and the fundamental-frequency terms of the third-degree polarization are computed. The component of the third-degree fundamental-frequency polarization in quadrature with the first-degree polarization describes the nonlinear phase shift behavior of the electron beam. (Author)

AD-260 413 Div. 8, 25
(1 Aug 61) OTS price $1.10

Ohio State U. Research Foundation, Columbus, Ohio.
THE MECHANISM OF OXIDE FORMATION IN THE INITIAL STAGES OF OXIDATION.
Quarterly rept. no. 4, 1 Apr-30 June 61, by D. W. Rausch, K. L. Moazed, and M. G. Fontana. 14 Apr 61, 3p.
(Contract DA 33-019-ORD-3387)
Unclassified report.

DESCRIPTORS: *Tantalum, *Tungsten, *Oxides, *Oxidation, *Field emission, Gases, Gas diffusion, Temperature, High temperature research, Pressure, *Adsorption, Resistance, Measurement, Vacuum apparatus, *Electron tubes, Test methods, Tantalum compounds, Tungsten compounds.

Field emission runs were made with W and Ta emitter tips fabricated from 4 to 6-mil-diam commercial grade W and Ta to observe the progress of adsorption of residual gases over a range of pressures and temperatures. Electrolytic polishing was used to produce the fine point required for emission. The tips were cleaned by resistive heating prior to emission. Field-evaporation was also utilized on Ta. The emission patterns of clean Ta and W tips were similar. The progress of adsorption of residual gases on W at elevated temperatures and constant pressure was observed. Work was initiated on the measurement of emitter tip temperature below 800 C by an electrical resistance method. A non-refrigerated, high-vacuum, isolation trap was developed and successfully operated in the vacuum system.

AD-260 429 Div. 8, 26
(1 Aug 61) OTS price $21.00

Raytheon Co., Newton, Mass.
INDUSTRIAL PREPAREDNESS STUDY ON TRANSISTORS. SILICON VIDEO AMPLIFIER (DEVICE 25).
Final engineering rept. 12 Sep 57-6 Oct 60, by John Sardella, Frank Dukat, and others. 6 Oct 60, 351p. incl. illus. tables.
(Contract DA 36-039-sc-72710)
Unclassified report

DESCRIPTORS: *Video amplifiers, Silicon, *Transistors, Transistor amplifiers, Amplifiers, *Manufacturing methods, Processing, Production, Quality control, Semiconductors, Materials, Standardization, Design, Tests, Military requirements.

Research was concerned with the development of a 6 mc. video amplifier device (device 25), which was produced on a pilot production line. The developmental phase was successfully completed as well as the manufacture of the required 3,000 units. The design of device 25 consisted of a fused-diffused structure with an annular base ring connection to the base layer. Several of the processing steps were optimized and mechanical aids such as jigs and fixtures were introduced. The conversion from sealed tube to open-tube production of diffused semiconductor material was achieved. The emitter fusion process itself was thoroughly investigated and the choice of argon as a firing ambient, as well as optimized firing temperatures and dot sizes gave a device which met the military objective specifications. (Author)

AD-260 434 Div. 8
(28 July 61) OTS price $3.60

Centre de Physique, Electronique et Corpusculaire (France).
HIGH POWER X-BAND BACKWARD WAVE OSCILLATOR TUBE.
Technical status rept. no. 8, 1 July-31 Dec 60, by J. Nalot and P. Peironet, 31 Dec 60, 15p. illus. (Rept. no. 95.041; WR 636)
(Contract AF 61(052)68)
(RADC TN 61-143) Unclassified report

DESCRIPTORS: X Band, *Backward-wave oscillators, Oscillators, *Microwave oscillators, Electron tubes, Design, Tests, France, Cooling, Propagation.

The experimental results on the tubes equipped with 4 interdigital lines mounted in parallel were not satisfactory. These negative results were thought to be due to the existence of several parasitic modes. Efforts were then switched to the following problems: (1) complementary tests on interdigital lines, essentially centered on propagation and the parasitic modes so as to understand better the behaviour of the circuits mounted in parallel, and (2) study of a new water cooled tube. A linear tube was also studied, based on the use of a new gun type. (Author)

AD-260 458 Div. 8, 30
(2 Aug 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
A LABORATORY STANDARD SIGNAL-TO-NOISE EQUALIZER, by Anthony K. Newman. Dec 60, 15p. incl. illus.
(Technical rept. no. 59)
(Contract AF 19(604)4575)
(AFCCDD TN 60-59) Unclassified report

DESCRIPTORS: *Signal-to-noise ratio, Measurement, Functions, *Speech, Attenuation, Electronic circuits, *Audiofrequency attenuators, Standards, Voltmeters, Design, Meters, *Discriminators.

An instrument is described which was designed to measure and equate the peak voltage of a word, or the average peak voltage of a group of words, with the rms voltage of suitably filtered Gaussian noise in such a way as to produce a well-defined standard signal-to-noise ratio of zero db. Relative to this zero standard ratio, any practical signal-to-noise ratio may be obtained by adjusting either the noise or the speech channel attenuators. An increase in the attenuation of the noise or a decrease in the attenuation of the speech will have the effect of increasing the signal-to-noise ratio. The important features of this instrument are: (1) a panel meter provides a continuous measurement of the Gaussian noise so that during playback or recording of an experimental tape through the laboratory standard, the signal-to-noise ratio may be checked and maintained constant (2) a five-channel instantaneous amplitude-discriminator measures and standardizes the auditory input to the laboratory standard whereby variations in speech-peaks may be checked, and corrected if desired, and (3) both the noise meter and the amplitude-discriminator monitor the operation of the laboratory standard continuously to ensure that a constant signal-to-noise ratio is maintained. (Author)

AD-260 459 Div. 8, 7
(1 Aug 61) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
AN IMPROVEMENT IN THE RELIABILITY OF ANALOG CIRCUITRY THROUGH THE APPLICATION OF REDUNDANCY, by A. A. Sorensen. May 61, 39p. incl. illus.
(Rept. no. 7203-0002-NU-000)
(Contract AF 04(647)619)
Unclassified report

DESCRIPTORS: Control systems, *Electronic circuits, Alternating current, Direct current, *Amplifiers, Reliability, *Electrical networks, Failure (Mechanics), Reduction, Electrical engineering, Electric relays, Switching circuits, Probability, *Power supplies, Design, Trigger circuits, Space flight.

The results obtained by the application of redundancy to various types of analog circuitry are summarized. Comparisons are made between several possible techniques after the application of both passive and active switching redundancy are applied. Formulas are derived enabling the designer to find out the actual reliability improvements that may be expected from redundancy. (Author)

AD-260 495 Div. 8, 25, 26
(27 July 61) OTS price $6.60

Savoy Electronics, Inc., Griffin, Ga.
INDUSTRIAL PREPAREDNESS MEASURE QUARTZ CRYSTAL UNITS CR-(XM-23)/U.
Final rept.,
by John J. Erasmus. 1960, 58p. incl. illus.
(Contract DA 36-039-sc-75977)
Unclassified report

DESCRIPTORS: *Quartz crystals, Processing, Production, Manufacturing methods, Quality control, Machining, Preparation, Aluminum coatings, Seals, Soldering, Test methods, Tests, Crystals, Crystal holders, Adhesives, Instruction manuals.

A process is described for the fabrication of CR-(XM-23)/U quartz crystal units in the range of 50 to 100 Megacycles. No special changes in the normal production techniques were required although many refinements in existing procedures were found necessary to get acceptable yields. A few special tools were developed that proved to be very helpful in producing the pilot run. Details of both refined techniques and tooling are discussed. Problems of especial importance that arose include: (1) controlling flatness of the finished blank, (2) polishing the quartz blanks, (3) base plating, and (4) sealing the HC-18/U crystal holder. (Author)

AD-260 500 Div. 8, 30
(31 July 61) OTS price $.50

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A PORTABLE LOW LEVEL LIGHTMETER.
Rept. on Research on Quantum Nature of Light,
by R. K. H. Gebel. Apr 61, 6p. incl. illus.
(Supersedes AD 58-440)
(Proj. 7072)
(ARL-13) Unclassified report

DESCRIPTORS: *Photometers, Calibration, Design, Measurement, Tests.

Explained herein is the operation and calibration of a portable low level lightmeter designed in connection with work on the problem of light amplification. This light meter can be used to determine the light levels from as low as 10 to the -8th foot-Lambert (ft-L). (Author)

AD-260 508 Div. 8, 26
(1 Aug 61) OTS price $1.10

Radio Corp. of America, Somerville, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON DEVICES 1, 13, 14, 15.
Quarterly rept. no. 15, 1 Feb-30 Apr 61,
by L. B. Balents and H. Meisel. 30 Apr 61, 6p.
(Contract DA 36-039-sc-72709)
Unclassified report

DESCRIPTORS: *Transistors, *Manufacturing methods, Production, Germanium alloys, Silicon, Design, Tests.

Work on Device 1 was completed. The production phase testing program and the pilot run requirements for the PNP version of devices 13 and 14 were completed and the line shut down. Production testing for these units was initiated. (Author)

AD-260 525 Div. 8
(2 Aug 61) OTS price $7.60

Electronics Research Lab., U. of Calif., Berkeley.
(No Title).
Consolidated quarterly progress rept. no. 1 for period ending 15 May 61.
15 May 61, 61p. incl. illus.
(Contracts AF 49(638)1043, AF 19(604)2270, AF 19(604)5466, AF 33(616)6139, AF 33(616)7553, AF 18(600)1521, AF 49(638)102, AF 41(657)114, and Nonr-22253)
Unclassified report

DESCRIPTORS: *Bibliography, Scientific research, *Electronic equipment, *Microwave equipment, *Electronic circuits, Transistors, Amplifiers, *Electron tubes, Oscillators, Wave transmission, Electromagnetic waves, Plasma physics, *Electromagnetic theory, Microwaves, Propagation, Control systems, Data processing systems, Information theory, Radiation damage, Microwave amplifiers, Solid state physics, Transistor amplifiers.

A review is presented of the research projects conducted within the Electronics Research Laboratory, University of California, Berkeley, and of the progress made during the three month period ending May 15, 1961. The research work is separated into the following areas: (1) circuits, (2) microwave electronics and plasmas, (3) radiation and propagation, (4) solid-state electronics, (5) systems, and (6) miscellaneous. (Author)

AD-260 532 Div. 8, 25
(2 Aug 61) OTS price $10.10

Electro-Mechanics Co., Austin, Tex.
A SPHERE TECHNIQUE FOR THE MEASUREMENT OF THREE DIMENSIONAL RADIATION PATTERNS.
Final rept. on Interference Measurement Techniques and Specifications,
by Fred J. Morris, Francis Tormollan, and others.
10 May 60, 114p. incl. illus. tables.
(Contract AF 30(602)1884, Proj. 4540)
(RADC TR 61-26) Unclassified report

DESCRIPTORS: *Antenna radiation patterns, *Radar antennas, Measurement, Electromagnetic waves, *Electromagnetic wave reflections, Radiofrequency, Tests, *Test methods, Lobing, Spheres, Airborne.

The Sphere Technique for the Measurement of Three-Dimensional Radiation Patterns from radars involves measuring the radiation reflected from a large conductive sphere suspended below a tethered balloon. The system is passive in that all of the measurement equipment is located on the ground and removed from the radar antenna. Tests showed that the sphere is a good reflector, that there are no basic differences in the technique, and that there is sufficient dynamic range in the measurement equipment to permit detailed side and back lobe examination of the radiation patterns. The measurement antennas and shielding techniques were designed specifically to achieve isolation from the direct radiation of the transmitting radar. Isolations of approximately 75db were achieved and the ratio between signal level received from the sphere and signal level received directly from the radar could be maintained sufficiently large so as to insure valid data. It is concluded that the Sphere Technique is valid, and it is recommended that field measurements be undertaken to provide for a comparative analysis of measurements made by other techniques. (Author)

AD-260 537 Div. 8
(3 Aug 61) OTS price $4.60

Istituto Universitario Navale, Naples (Italy).
NONUNIFORM TRANSMISSION LINES AND BROADBAND MICROWAVE ABSORBERS.
Annual technical note no. 2, 1 Dec 59-28 Feb 61 on Theoretical and Experimental Research on Absorption, Transmission and Radiation of Electromagnetic Waves,
by G. Latmiral and R. Vinciguerra. 28 Feb 61, 48p. incl. illus. tables.
(Contract AF 61(052)36)
(RADC TN 61-142) Unclassified report

DESCRIPTORS: Italy, Electromagnetic waves, *Microwaves, Absorption, *Transmission lines, Broadband, Materials, Integral transforms, *Electromagnetic wave reflections, *Wave transmission, Magnetic materials, Measurement, Dielectric properties, Antiradar coatings, Differential equations, Mathematical analysis, Integral equations.

Theoretical absorbers are proposed whose per-

formance should be better than that of the commercial absorbers presently available. Some measurements and considerations on commercial absorbers are appended as a confirmation of the fact that, when the measurements are properly interpreted, their performance is considerably inferior to that of the proposed theoretical absorbers. The performance of the commercial absorbers is ordinarily measured on panels of limited dimensions and under slightly oblique incidence. However, as the reradiation patterns of a metal plate covered with an absorbing layer are considerably broader than those without absorber, the data obtained by this method are generally far better than those obtainable by waveguide measurements or theoretical evaluation and valid for normal incidence. (Author)

AD-260 544 Div. 8, 26
(3 Aug 61) OTS price $7.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
HIGH-POWER TUBE PROGRAM.
Semiannual technical summary rept.
30 June 61. 68p. incl. illus. tables, 10 refs.
(Contract AF 19(604)7400)
(ARPA Order no. 85-61) Unclassified report

DESCRIPTORS: *Electron tubes, *Klystrons, *Beam power tubes, *Radar duplexers, Cathodes (Electron tubes), Secondary emission, Electron beams, Processing, Production, Design, L band, Test equipment, Tests.

Work on klystron analysis was concerned primarily with experimental verification of the theory. Generally good agreement between theory and experiment was obtained. Preliminary results obtained with the beam pulse heating tube indicate an unexpected surface temperature function when the surface is heated with a pulsed electron beam. Beam study continued to be concerned with the electrolytic tank and computer facility. The secondary emission work was completed. The effects of H firing, magnetic field, angle of incidence, and electron bombardment on the secondary emission ratio of a number of materials having a maximum ratio less than one have been measured. A technique for measuring loss distribution in rf cavities has been established. Duplexer investigations have been concerned with window materials, pressure-measuring techniques, and the use of a hot cathode electron source to provide a more reliable and rapid breakdown of the TR tube. (Author)

AD-260 555 Div. 8, 25
(3 Aug 61) OTS price $2.60

Electro-Mechanics Co., Austin, Tex.
A SPHERE TECHNIQUE FOR THE MEASUREMENT OF THREE DIMENSIONAL RADIATION PATTERNS. PART 2. THEORY OF THE SPHERE TECHNIQUE.
Final rept., Section 4, pt. 2, on Interference Measurement Techniques and Specifications.
15 Feb 60, 17p. incl. illus. tables.
(Contract AF 30(602)1622, Proj. 4540)
(RADC TN 61-163) Unclassified report

DESCRIPTORS: *Antenna radiation patterns, *Radar antennas, Measurement, Electromagnetic waves, *Electromagnetic wave reflections, Radiofrequency, *Test methods, Spheres, Airborne, High frequency.

A method is presented for gathering three-dimensional radiation pattern data. A spherical reflector is placed at various positions in space and used a directional antenna to receive the reflection from the sphere. The basic reflection equation is developed and modified so that the reading on the intensity meter may be converted into the energy level at the sphere. The constant, K, of the sphere is developed and a test described whereby K may be determined. Rules for determining other parameters such as sphere size, distances between antennas and sphere, and frequencies at which the system is usable are all developed. A problem is worked out to demonstrate the use of the equation E equals KR sub 2 E sub R where E is the field strength in volts/meter at the sphere, E sub R is the field strength indicated at the field intensity meter, K is the sphere constant for the frequency considered, and R sub 2 is the distance between the sphere and the intensity meter antenna. A discussion of the method used to improve the signal to leakage ratio is given. The techniques described are limited to use of high-power, high-frequency radiation systems. (Author)

AD-260 572 Div. 8
(3 Aug 61) OTS price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
NETWORK SYNTHESIS USING SIGNAL FLOW GRAPHS,
by Eleanor Kushel. 5 May 61, 38p. incl. illus.
(Research rept. no. PIBMRI-906-61)
(Contract DA 30-069-ORD-1560)
(AROD rept. no. 1538:16) Unclassified report

DESCRIPTORS: Simultaneous equations, Synthesis, Transfer functions, *Electrical networks, *Microwave networks, Impedance, Resistance, Circuits, Mathematical analysis.

A technique for the synthesis of driving point immittance functions through the use of signal flow graphs is developed. The method is shown to be a completely general one. A signal flow graph is drawn after an examination of the driving point function. This flow graph is related to a realizable network. The values of elements in the branches of the network are found from a consideration of loop gains in the flow graph. The theory involved is first illustrated in terms of the synthesis of 2 element type circuits. Then, the general R-L-C case is treated. (Author)

AD-260 599 Div. 8
(3 Aug 61) OTS price $1.60

Electronics Research Lab., U. of Calif., Berkeley.
THE EFFECTS OF RF ENERGY ON THE PUMPING SPEED OF A TITANIUM SPUTTER PUMP,
by J. F. Fry. 18 Apr 61, 13p. incl. illus. table.
(Scientific rept. no. 13; Series no. 60, Issue no. 355)
(Contract AF 19(604)2270)
(AFCRL-324) Unclassified report

DESCRIPTORS: *Vacuum pumps, Pumps, Electronic equipment, Anodes, Cathodes, Titanium, Magnetic fields, Radiofrequency, Energy, Gas ionization, Degasification, Design.

For certain applications greater pumping speed of the sputter pump is desirable. The pumping speed is directly dependent on the strength of the applied magnetic field, the value of the anode voltage, and the area of the titanium cathodes. The difficulty in increasing the

pumping speed by varying the anode voltage or the area of the cathodes is that of providing the associated large magnetic fields. For this reason, a standard sputter pump was modified and the introduction of RF energy was explored to see if the pumping speed would increase. The RF energy was applied at the ion cyclotron frequency of the ionized gas in the system. The ions should gain energy and therefore an increase in pumping speed would be observed. The results of this experiment show that the pumping speed is not increased by the introduction of RF energy. (Author)

AD-260 600 Div. 8
(3 Aug 61) OTS price $3.60

Electronics Research Lab., U. of Calif., Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS,
Quarterly Progress rept. no. 5, 1 Feb-31 Apr 61,
by J. R. Whinnery, C. K. Birdsall and others.
31 May 61, 29p. incl. illus. (Rept. no. 5)
(Contract DA 36-039-sc-85278)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, Space charges, Electron beams, Noise (Radio), Reduction, Electron guns, *Diodes, Numerical methods and procedures, Fourier analysis, Transformations (Mathematics), Measurement, Statistical analysis, Differential equations.

Space-charge wave equations for a crossed-field accelerating beam were derived using a simple sheet charge model. The differential equation for the ac current density in the y-direction is the same as obtained by Smullin for an O-type beam. This suggests that noise-reducing schemes similar to O-type schemes may be used in a crossed-field amplifier. Sole current and noise power measurements made using an amplifier featuring a Kino gun are described. An electron gun using a steeped cathode is also described. Spectral calculations based on the approximate analysis of the potential minimum are presented; the parameters and results are discussed. The model, assumptions, and formulation for a Monte Carlo study of the effects of the potential minimum on noise in a diode are described. (Author)

AD-260 627 Div. 8, 6
(7 Aug 61) OTS price $2.60

Naval Research Lab., Washington, D. C.
HIGH-POWER TRANSISTORIZED AMPLIFIERS FOR SONAR APPLICATIONS,
by W. M. Lawson, Jr. 2 Aug 60, 23p. incl. illus. tables (Rept. no. 5484)
Unclassified report

DESCRIPTORS: *Transistors, *Transistor amplifiers, Amplifiers, *Power amplifiers, *Sonar equipment, Transducers, Cooling, Reliability, Electronic circuits, Design, Heat exchangers, Water coolers, Coolants.

The structural simplicity, ruggedness, low-frequency characteristics, long life, and low operating temperatures of transistors make them ideal for use as components in sonar power amplifiers. The major problem in the design of transistorized power amplifiers is the provision of adequate cooling. The necessary 0.2 C per watt thermal resistance is provided by the water-cooled heat sink which was developed. The power-amplifier design gives a unit which is capable of developing 480 watts of single-frequency sinusoidal power in a matched resistive load over a frequency range of 180 c to 3.8 kc with a distortion less than 10%, provided that one gallon per minute of fresh water is available at a temperature less than 30 C. The unit is 5 x 5 x 15 in. in size and weights about 12 pounds. (Author)

AD-260 658 Div. 8
(3 Aug 61) OTS price $12.00

Microwave Lab., Stanford U., Calif.
SOME METHODS OF FAST-WAVE AMPLIFICATION IN PARAMETRIC ELECTRON-BEAM DEVICES,
by Jacques Spalter, Apr 61, 169p. incl. illus. tables, 19 refs. (Scientific rept. no. 29; ML rept. no. 810)
(Contract AF 19(604)1930)
(AFCRL-325) Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, *Electron beams, Electrostatics, Space charges, Cavity resonators, Transients, Klystrons, *Electron tubes, Cyclotrons, Focusing, Coupling circuits, Mathematical analysis, Design.

The amplification mechanism of 2 types of electron-beam parametric amplifiers is investigated. The first type is an electrostatically-focused amplifier and the second is a space-charge wave amplifier which uses resonant cavities for fast-wave coupling. In both cases a small-signal approximation is made and the only effects considered are those of the signal, idler and pump frequencies. An electrostatic parametric amplifier was designed and built for the case where the pump frequency is twice the signal frequency. (Author)

AD-260 696 Div. 8, 14
(4 Aug 61) OTS price $5.60

Electronic Defense Labs., Mountain View, Calif.
MECHANICAL DESIGN AND DEVELOPMENT OF LIGHTWEIGHT ANTENNA REFLECTORS AND POSITIONING DEVICES.
PART 2. DESIGN AND DEVELOPMENT OF LIGHTWEIGHT ANTENNA REFLECTORS,
by Mack Suliteanu. 30 June 61, 45p. incl. illus. tables (Technical memo. no. EDL-M350, pt. 2)
(Contract DA 36-039-sc-85402)
Unclassified report

DESCRIPTORS: *Antennas, *Reflectors, *Foams, Antenna radiation patterns, Materials, Urethanes, Polymers, Mechanical properties, Design, *Parabolic antennas, *Radar reflectors, *Radar antennas, Measurement.

Two lightweight reflectors were designed and developed to meet the operational needs of the Signal Corps. One is a low-cost, rigid-foam reflector, with a feed system foamed into position. Experimental models of this type reflector were tested on the antenna range against metallic reflectors for comparison of performance at frequencies from 8.5 to 11.5 gc. The results show that the 2 reflectors are very comparable for surface accuracy and gain characteristics. Complete scale models of rigid-foam reflectors will be built and tested for mechanical, electrical, and thermal properties. This reflector can be more easily fabricated

than present designs; since the only precise dimension is the reflective surface, it requires no special fixtures and only simple cutting tools. The fabrication process is facilitated by a specially designed field portable Foam Shaping Machine (FOSHAM). The other type reflector is a folding, portable reflector, light enough to be hand-carried, and capable of being erected quickly and efficiently for military tactics on any terrain. (Author)

AD-260 697 Div. 8, 1, 12
(8 Aug 61) OTS price $1.60

Hughes Aircraft Co., Culver City, Calif.
STUDY OF CONTROL OF ELECTROMAGNETIC RADIATION FROM AIRCRAFT AND SPACE VEHICLES.
Final rept.
28 Apr 61, 9p.
(Contract AF 19(604)3508)
(AFCRL-356) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Control, Aircraft, Satellite vehicles, Spaceships, *Antennas, *Antenna radiation patterns, *Slot antennas, Polarization, Aerial reconnaissance, Synthesis, *Waveguide slots, Propagation, Electromagnetic fields, Waveguides, Fourier analysis, Radar antennas, Green's function, *Satellite vehicle antennas, *Airplane antennas, Mapping.

Contents:
A new method of pattern synthesis for linear arrays
Maximally flat and quasi-smooth sector beams
Near field analysis of circular aperture antennas
Periodically slotted surface wave structure
Dual mode beacon antenna with polarization diversity
Derivative control in shaping antenna patterns
Equivalence between continuous and discrete arrays
Interpolation techniques applied to pattern synthesis
Strip mapping beneath airborne reconnaissance vehicle
A method for synthesis of optimum directional patterns from non-planar apertures

AD-260 698 Div. 8, 25
(4 Aug 61) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
A SIMPLIFIED METHOD FOR DETERMINING ELECTROMAGNETIC CHARACTERISTICS ABOUT A HYPERSONIC RE-ENTRY BODY,
by Anthony D. Ferrari, Paul O. Scheibe, and Maynard B. Stevenson. 12 June 61, 42p. incl. illus. (Technical memo. no. EDL-M363)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Re-entry vehicles, Plasma physics, Electromagnetic waves, Hypersonic flow, Attenuation, Telemetering data, Aerodynamic configurations, Determination.

A method is developed for determining the total attenuation of a telemetry signal traveling through the plasma sheath surrounding a hypersonic re-entry body. Plane wave absorption is assumed and reflections and near-field effects are neglected. The re-entry body is assumed to be in the shape of a spherically blunted cone and to be entering the atmosphere at zero angle of attack. Given only the body size, altitude and velocity, the attenuation of a specified signal frequency may be obtained. The advantage of the method is its amenability to hand calculation rather than extensive computer programming. This method for determining hypersonic flow characteristics is compared to a more elaborate solution. Signal attenuation computations are made for several re-entry body types. (Author)

AD-260 699 Div. 8
(4 Aug 61) OTS price $9.60

Electronic Communications, Inc., Timonium, Md.
LOW FREQUENCY BROADBAND FERRITE COMPONENTS.
Final development rept. 15 June 59-30 June 61, by G. V. Buehler and A. F. Eikenberg. 30 June 61, 119p. incl. illus. tables.
(Contract NObsr-77602)
Unclassified report

DESCRIPTORS: Broadband, Ferrites, *Ferromagnetic materials, *Transmission lines, Waveguides, Magnetic fields, Radiofrequency power, Electronic circuits, Theory, Coaxial cables, Electromagnetic waves, Magneto-optic rotation, Very high frequency, Ultra high frequency, Design, Electrical properties, Temperature, Dielectric properties.

This report includes:
AN APPROXIMATE SOLUTION TO SOME FERRITE FILLED WAVEGUIDE PROBLEMS WITH LONGITUDINAL MAGNETIZATION, by Sheldon S. Sandler. 15 Sep 60 rev. 28 Nov 60, 7p. incl. illus.
(Contracts AF 19(604)5234 and NObsr-77602)
Reprint from IRE Transactions on Microwave Theory and Techniques, MTT-9:162-168, March, 1961.
(Copies not supplied by ASTIA)

Development work is reported on low frequency, broadband ferrite components. A four wire line, an asymmetrically loaded stripline, and a stripline Y circulator were investigated. The Y circulator was found to be advantageous for use at frequencies as low as about 100 Mc. High power measurements (1 megawatt peak) were performed on this structure. Performance and design data are given for all three structures. (Author)

AD-260 702 Div. 8
(7 Aug 61) OTS price $21.00

General Electric Co., Owensboro, Ky.
INVESTIGATION OF THE EFFECTS OF OPERATING CONDITIONS ON SUBMINIATURE ELECTRON TUBES.
Final rept., vol. 2, 1 July 59-1 July 60, by D. E. Lammers. 1 July 60, 363p. incl. illus. tables.
(Contract DA 36-039-sc-78115)
Unclassified report

DESCRIPTORS: *Subminiature electron tubes, Electron tubes, Subminiature electronic equipment, Life expectancy, Tests, Physical properties, *Electronic circuits, Design, Voltage, Filaments, Temperature, Measurement, Statistical analysis.

JAN-5703WA- Varying filament voltage had greatest effect on pulse current characteristics. Envelope temperature and plate dissipation had a lesser effect. JAN-5896-Filament voltage was the

only cause of pulse characteristics changes. Percent operatives were excellent under all test conditions. JAN-5902-Pulse characteristics were very stable. Early hour stability was affected by variation of filament voltage. Envelope temperature was of great importance in causing catastrophic failures. Filament voltage ranked next by a factor or 3 to 1. JAN-6021- Filament voltage was again the most important factor with envelope temperature and plate dissipation of less importance. Type 6286-Mechanical Excitation-Percent operatives of lower G lots were slightly better with voltages applied. No difference was noted between operating and non-operating lots. Lots with higher G levels developed more vibrational output voltage with time. Pulse life test mechanics and general tube performance are discussed. (Author)

AD-260 703 Div. 8, 26
(7 Aug 61) OTS price $10.50

General Electric Co., Owensboro, Ky.
RESEARCH AND INVESTIGATION ON RADIATION RESISTANT, HIGH TEMPERATURE THERMIONIC CIRCUITRY.
Interim engineering rept. no. 1, 18 Apr-30 June 61,
by Fred J. Schmidt. 30 June 61, 124p. incl. illus. tables.
(Contract AF 33(616)8096)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, Radiation damage, Reduction, *Electronic circuits, High temperature research, Reliability, *Electron tubes, *Resistors, *Capacitors, *Coils, Materials, Design, Manufacturing methods, Tests, Test equipment, Ceramic materials, Metals, Coatings, Thermionic emission, Life expectancy, Electrical properties, Titanium, Test methods, Trigger circuits, Triggered gates, Radioactivity, Radiation effects, Aluminum coatings, Electrophoresis.

Investigations were conducted to establish the feasibility of building and operating high temperature, nuclear radiation resistant, integrated, thermionic electronic circuitry of high efficiency and long life. Small size heaterless electron tubes, resistors, and capacitors were made of titanium and ceramic materials. Typical characteristic test results for diodes, triodes, resistors, and capacitors are depicted by curves. Preliminary half adder and shift-register circuits were assembled and tested using representative, available components. Studies were made of their tolerances and of their sensitivity to supply voltage changes. The gating system for the shift-register circuitry was developed and is presented along with schematic diagrams of these circuits. Circuit testing techniques are discussed, along with special test equipment modifications necessary for the 580 C environment. A materials investigation program was initiated to develop a protective coating for the titanium electrodes and module interconnections. (Author)

AD-260 722 Div. 8
(8 Aug 61) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
A PERIODIC STRUCTURE OF CYLINDRICAL POSTS IN A RECTANGULAR WAVEGUIDE,
by Edward E. Altshuler. Apr 61, 13p. incl. illus.
(Rept. no. AFCRL-175)
(Proj. 4600)
Unclassified report

DESCRIPTORS: *Waveguides, S band, Propagation, Electromagnetic waves, Phase measurement, Standing wave ratios, Electromagnetic wave reflections, Impedance, Tests, Mathematical analysis, Tuning devices, Test methods.

The propagation characteristics of a rectangular waveguide loaded with uniformly spaced cylindrical posts (periodic structure) are investigated at a frequency of 2840 mc. A qualitative discussion on the expected behavior of the effective guide wavelength of this type of periodic structure is presented and it is shown that the presence of the posts reduces the guide wavelength of the waveguide. The guide wavelength is then measured as a function of post diameter, post depth, and post spacing. Curves enabling one to design periodic structures which have guide wavelengths in the region of the free space wavelength are presented. (Author)

AD-260 737 Div. 8
(8 Aug 61) OTS price $7.60

Columbia Technical Corp., Woodside, N. Y.
CABLE (DELAY LINE), DISTRIBUTED CONSTANT TYPE, TEMPERATURE AND FREQUENCY STABLE.
Interim development rept. no. 3, 1 May 60-30 Apr 61.
1 Aug 61, 73p. incl. illus.
(Contract NObsr-77562)
Unclassified report

DESCRIPTORS: *Delay lines, *Coaxial cables, Radiofrequency cables, Temperature, Humidity, Failure (Mechanics), Design, Tests, Electrical properties, Installation, Life expectancy, *Electrostatic capacitance, Reliability, Naval equipment, Electronic equipment, Test equipment, Frequency stabilizers, Impedance, Dielectric properties, Measurement.

The intrinsic electric stability of RG-65A/U delay cable was investigated and the stability mechanism analyzed. It was found that temperature-dependent changes in the characteristic impedance and time delay can be attributed largely to capacitance variations in the dielectric between inner and outer conductors resulting from expansion and contraction of the cable components. The mechanism of these changes was determined by test and confirmed by theoretical analysis. A special test was developed for the capacitance variation measurements in which the outer conductor of the cable is replaced by conducting water. As a result of the findings of the stability tests, design specifications were established for an improved RG-65A/U cable. (Author)

AD-260 741 Div. 8, 26
(8 Aug 61) OTS price $2.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
AGING CHARACTERISTICS OF QUARTZ CRYSTAL RESONATORS.
Quarterly rept. no. 1, 15 Feb-15 May 61,
by R. B. Belser and W. H. Hicklin. 15 May 61, 21p. incl. illus. table.
(Contract DA 36-039-sc-87407)
Unclassified report

DESCRIPTORS: Aging, *Quartz resonators, *Quartz crystals, Crystals, Frequency stabilizers, *Manufacturing methods, Bonding, Tests, Processing, Measurement, Radiofrequency, Design, Test equipment, Aluminum.

Research is concerned with the effects of materials and fabrication techniques on the frequency

stabilities of quartz crystal resonators. Of particular interest are resonators operated in the overtone modes. Vacuum equipment for fabrication of resonators of frequencies of 16, 48 and 80 mc was modified to incorporate improved pumping and cold trapping in order to perform pressure processing steps. A 200-unit constant temperature oven was also improved by incorporation into it of coaxial leads and BNC terminations. The frequency measurement system, based on a single-ended bridge and counter method, was modified to incorporate automatic gain control of the crystal impedance meter oscillator and automatic nulling of the bridge. Twenty aluminum plated resonators were fabricated and measured. Initial aging measurements of these units indicated excellent stabilities. (Author)

AD-260 750 Div. 8, 25, 15
(8 Aug 61) OTS price $2.60

Norwegian Defence Research Establishment.
A THEORETICAL INVESTIGATION OF A TRAVELING WAVE PARAMETRIC AMPLIFIER,
by A. Sorenssen. 18 Mar 61, 25p. incl. illus.
(Technical note no. 1)
(Contract AF 61(052)484)
(AFCRL-526) Unclassified report

DESCRIPTORS: *Traveling wave tubes, *Differential equations, Mathematical analyses, Simultaneous equations, Amplifiers, Nonlinear systems, Theory.

A mathematical treatment is given of the wave phenomena in a traveling wave parametric amplifier. The waves are described by two coupled differential equations of the 2nd order. By the elimination of one of the unknowns a 4th order differential equation arises. There are 4 waves of the signal frequency and 4 waves of the idler frequency, in contrast to linear transmission lines, where there are only 2 waves on a single frequency. The influence of the reflected waves on the stability of the amplifier is investigated, and oscillation criteria are given. Some methods to prevent oscillation are suggested. (Author)

AD-260 768 Div. 8
(4 Aug 61) OTS price $1.60

Radio Corp. of America, New York.
DEVELOPMENT OF A DISPLAY STORAGE TUBE TO BE USED AT HIGH TEMPERATURES.
Monthly engineering rept. for June 61,
by R. P. Stone. 10 July 61, 2p.
(Contract NObsr-77644)
Unclassified report

DESCRIPTORS: *Storage tubes, Electron tubes, Temperature, Display systems, Design, Tests, Reliability, Vibration, Physical properties, Shock.

The environmental testing program was continued. A tube was heated to 120 C for 2 hours, then tested with normal operating voltages while maintained at this temperature. Writing, storage, and erasure could be accomplished with no observable change from room temperature operation. Thus it seems that the high temperature operation requirement can be met. Two tubes, with bases potted in flexible epoxy, were tested in the altitude chamber. At conditions simulating 76,000 ft altitude, full voltages were applied and less than 1 microampere leakage current observed. Therefore it appears that the altitude requirement can be met. When the tube is supported in the vibration test mount in compression between the neck flare and the faceplate, no significant bulb resonances are found below 2000 cycles. This means that it is possible to monitor the input to the tube with an accelerometer attached permanently to the test mount, and that it is not necessary to cement an accelerometer to each tube to be tested. Two tubes successfully passed the 20 G non-operating shock test, with both 11 millisecond and 32 millisecond shock duration. No deterioration of their operation was noted in subsequent testing. (Author)

AD-260 771 Div. 8, 25
(7 Aug 61) OTS price $5.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
GUIDE TO THE STRUCTURAL DESIGN OF TRUNCATED SPHERICAL RIGID GROUND RADOMES,
by Robert B. Curtis, June 61, 54p. incl. illus. 12 refs. (RADC TR 61-84)
(Proj. no. 5579; In cooperation with Armour Research Foundation, Chicago, Ill., Contract AF 30(602)1860)
Unclassified report

DESCRIPTORS: *Radomes, Design, Structures, Stability, Load distribution, Wind, Membranes, Buckling, Theory, *Elastic shells, Sandwich construction, Stresses, Mathematical analysis.

A compilation of the analytical operations for the structural analysis of a truncated spherical shell based jointly upon an evaluation of research effort and operational performance is presented. The 4 primary problem areas of loading, shell conversion, stability, and strength which confront the engineer in the structural design of such a shell are discussed in detail. In each of these problem areas, computational methods or approaches are offered which may be adopted as design procedure. (Author)

AD-260 776 Div. 8
(7 Aug 61) OTS price $10.50

Syracuse U. Coll. of Engineering, N. Y.
TUNNEL DIODE THEORY AND APPLICATIONS,
by Rajendra Nanavati, W. Howard Card and others.
10 Apr 61, 135p. incl. illus. tables (Rept. no. EE 751-614-1; Technical rept. no. 1)
(Contract AF 30(602)2177)
(RADC TR 61-111) Unclassified report

DESCRIPTORS: *Diodes, Electron tubes, Semiconductors, Electronic circuits, Theory, *Negative resistance circuits, Measurement, *Oscillator circuits, Design , Tests, Impedance matching, Test methods, Impedance, Circuits.

Research was concerned with tunnel diode theory and applications although a considerable portion of the effort was devoted to the related objective of developing a better understanding of the behavior of negative resistance devices in general. The basic theory of the tunnel diode is presented which summarizes most of the known essential elements of tunnel diode theory at the present time. (Author)

AD-260 781 Div. 8, 30
(8 Aug 61) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
A STATE ASSIGNMENT TECHNIQUE FOR SYNCHRONOUS

SEQUENTIAL NETWORKS,
by W. H. Davidow. 20 July 61, 34p. incl. illus. tables (Technical rept. no. 1901-1)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Digital systems, *Electrical networks, *Coding, Combinatorial analysis, Algebras, Diodes, Mathematical analysis, Statistical distribution, Computers, *Digital computers, Computer logic, Probability.

The way in which states are assigned in synchronous sequential networks greatly influences the cost of the associated logic. The state assignment problem is discussed, and an assignment technique is described that is very effective for non-cyclic circuits whose logical equations contain less than five variables. The principal advantages of this technique are that it is simple and that it can be applied effectively to find low-cost assignments for almost all synchronous sequential networks. A new approach to the assignment problem is introduced. Statistical predictions rather than absolute minimality are used as a criterion for evaluating the quality of an assignment. An assignment is considered to be good if the probability of finding a better assignment is small. (Author)

AD-260 783 Div. 8
(8 Aug 61) OTS price $9.60

Stanford Electronics Labs., Stanford U., Calif.
PARAMETRIC FREQUENCY CONVERTERS AND HIGH-FREQUENCY GENERATORS,
by P. M. Fitzgerald. 8 June 61, 112p. incl. illus. tables, 37 refs. (Technical rept. no. 315-2)
(Contract AF 33(616)7944)
Unclassified report

DESCRIPTORS: *Frequency converters, *Radiofrequency generators, Radiofrequency power, Microwaves, Microwave equipment, Theory, *Microwave oscillators, *Microwave amplifiers, Amplifiers, Oscillators, *Electronic circuits, Circuits.

Two parametrically excited frequency converters employing 3 frequencies in their operation were constructed. Experiments were performed which proved the theory of operation of these devices. The first converter was designed for examination of a mode of operation in which the pumping frequency was larger than the converted output frequency. Power at 3150 mc was converted to power at 3850 mc with a pumping frequency of 7000 mc. A positive gain of 20 db was realized with a bandwidth of approximately 0.01%. The second converter was designed for examination of a mode of operation in which the pumping frequency was lower than the converted output frequency. Power at 100 mc was converted to power at 3400 mc. The pump frequency in this converter was 3300 mc. A positive gain of 24 db was realized with a bandwidth of approximately 0.3 per cent. (Author)

AD-260 790 Div. 8
(4 Aug 61) OTS price $4.60

Westinghouse Electric Corp., Baltimore, Md.
RESEARCH ON MILLIMETER FERROMAGNETIC TYPE PARAMETRIC AMPLIFIER.
Quarterly progress rept. no. 1, 1 Feb-30 Apr 61, by Robert A. Moore and Milton L. Laflen. 30 Apr 61, 46p.
(Contract DA 36-039-sc-87401)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Microwave equipment, Amplifiers, *Ferromagnetic materials, Design, Ferrites, Electron tubes, Electromagnetic waves, Propagation, Magnetic fields, Magnetic properties, Dielectric properties, Measurement, Garnet, Mathematical analysis, Antiferromagnetism, Paramagnetic resonance.

The modified semistatic mode of parametric amplification was investigated to determine the mechanism responsible for its properties. Particular attention was given to the pump power efficiency. Although the power required by the medium is a very small fraction of a watt, the pump efficiency is so low that a power of several watts is required by the cavity. An alternate configuration is proposed in which a ferrimagnetic rod serves to support the electromagnetic as well as the magnetostatic resonances. This configuration should result in a more efficient utilization of the pump power. The propagation properties of electromagnetic waves along a longitudinally magnetized circular cylinder of ferrimagnetic material were investigated for this application. The properties of narrow-line-width garnets were measured by resonant cavity techniques except at the gyromagnetic resonant frequency. Line width measurements were conducted on a Magic-T bridge. (Author)

AD-260 792 Div. 8
(7 Aug 61) OTS price $5.60

Watkins-Johnson Co., Palo Alto, Calif.
RESEARCH AND DEVELOPMENT OF A 300-600 MCS HELITRON OSCILLATOR.
Technical rept. 18 Feb 60-19 June 61, by G. Wada. 19 June 61, 56p. incl. illus. 7 refs.
(Contract AF 30(602)2186)
(RADC TR 61-164) Unclassified report

DESCRIPTORS: *Microwave oscillators, Oscillators, Electron tubes, Electrostatics, Focusing, Electron beams, Electron guns, Electric fields, Ultra high frequency, Design, Radiofrequency power, Tests, Helixes, Tuning circuits.

Research was concerned with the development of a helitron oscillator with the following design objectives: 300 to 600 mc continuous frequency coverage, power output in excess of 30 mw, and noise and spurious 70 db below the main oscillation level. The program produced a tube meeting the design objectives and further, a single variable voltage for changing the oscillation frequency results in a flat power output from 35 to 52 mw. Also, tuning characteristics are such that a 3 to 1 change in circuit voltage results in a 2 to 1 change in oscillation frequency. Frequency pushing, frequency pulling, tuning curve, power output, starting current, and input VSWR data on the developed tube are illustrated. The entire device weight 4 pounds and features metal-to-ceramic tube construction. The tube uses an annular ring electrostatic focusing scheme for containing the beam between the beam minimum and point of entry into the tube. (Author)

AD-260 796 Div. 8
(7 Aug 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A CIRCUIT ANALOG FOR RADOME SIMULATION.
Interim engineering rept. on Study of Electromagnetic Window Dielectric Techniques,
by J. H. Richmond and C. E. Ryan. 15 Mar 61, 23p. incl. illus. (Rept. no. 1180-3)
(Contract AF 33(616)7614)
Unclassified report

DESCRIPTORS: *Radomes, Simulation, *Wave transmission, Reflection, Dielectrics, *Transmission lines, *Waveguide windows, Electromagnetic waves, Electromagnetic wave reflections, Measurement, Microwaves, Partial differential equations, Difference equations.

An artificial transmission line constructed of ladder sections can be arranged to simulate the problem of plane-wave transmission and reflection by a plane dielectric sheet or multilayer. Any polarization and angle of incidence can be simulated. A 10-section model was constructed and tested. For convenience, an operating frequency of 100 kc was used to simulate 10-kmc radome problems. The analog measurements show satisfactory agreement with the exact solutions. (Author)

9. FLUID MECHANICS

AD-260 000 Div. 9, 25
(24 July 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
MODEL EXPERIMENTS ON ATOMIZATION OF LIQUIDS,
by Mintscho Popov. July 61, 33p. incl. illus. (Technical trans. no. F-65 of Modellversuche mit Flussigkeitszerstaubung. Acad. Rep. Populare Romane, Rev. de Mecanique Appliquee (Bucharest) 1:71-88, 1956)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical Translation no. F-65.

DESCRIPTORS: *Atomization, Drops, Hydraulic systems, Liquids, Fluids, *Fluid mechanics, Photographic analysis, Water impingement, Jets, Fuel sprays.

The similarity laws are determined for the atomization of liquids with constant material properties and to verify them by comparison model experiments. The analyses show that the effect of the viscosity of the gas was very small and that approximate model experiments can be carried out without considering the ratio M of the gas to liquid viscosity, a condition that is difficult to satisfy. The derived and experimentally verified similarity laws permit the modeling of the atomization processes of liquids whereby considerable simplifications in experimental procedure and generalization of the experimental data are made possible. (Author)

AD-260 013 Div. 9, 12
(21 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THE EFFECT OF LATERAL- AND LONGITUDINAL-RANGE CONTROL ON ALLOWABLE ENTRY CONDITIONS FOR A POINT RETURN FROM SPACE,
by Alfred G. Boissevain. July 61, 10p. incl. illus. (NASA Technical note D-1067)

Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical Note D-1067.

DESCRIPTORS: Space probes, Manned, Atmosphere entry, *Re-entry aerodynamics, *Landing aids, Reliability, Range, Control systems, *Re-entry vehicles, Geometry.

The problem of return to a specified landing point on the earth from flight in space is considered by studying the interaction between an assumed control over the lateral and longitudinal range and the initial conditions of approach to the earth, given by orbital-plane inclination, vacuum perigee location, and time of arrival. The maneuvering capability in the atmosphere permits a point return for a range of entry conditions. A lateral-range capability of + or - 500 miles from the center line of an entry trajectory can allow a variation in the time of arrival of over 3.5 hours. Variation in the orbital-plane inclination angle can be as much as + or - 13 degrees. (Author)

AD-260 017 Div. 9, 25
(21 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
AN EXPERIMENTAL INVESTIGATION OF A FLOW MODULATOR USING A PIEZOELECTRIC CRYSTAL AS THE DRIVING ELEMENT,
by Leon M. Wenzel. July 61, 10p. incl. illus. (NASA Technical note D-877)

Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-877.

DESCRIPTORS: *Piezoelectric crystals, Fluid mechanics, Stability, *Damping, *Oscillation, *Modulation, Combustion chambers.

An experimental determination was made of the flow perturbation response attainable from a flow modulator using a piezoelectric crystal as the driving element. Data are presented which show the root-mean-square amplitude and phase shift of the flow perturbations with respect to the driving voltage over a frequency range from 100 to 5000 cps and at mean flow rates of 0.40 and 0.23 lb/sec. At frequencies below 600 cps, the amplitude repsonse is nearly flat. Above 600 cps, sharp resonances occur having peaks ranging up to approximately an order of magnitude. Above 1000 cps, the trend of the response is increasing. Exclusive of the resonance peaks, the perturbation amplitudes varied from approximately 0.0025 to 0.05 lb/sec. The form of the responses is essentially the same, but the amplitudes are higher at the lower mean flow. (Author)

AD-260 032 Div. 9, 10, 12
(24 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
TESTS OF AN ASYMMETRICAL BAFFLE FOR FUEL-SLOSHING SUPPRESSION,
by Henry A. Cole, Jr., and Bruno J. Gambucci. July 61, 18p. incl. illus. (NASA Technical note D-1036)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1036.

DESCRIPTORS: Damping, *Liquid rocket propellants, *Propellant tanks, Launching, Fluid mechanics, Stability, Guided missiles, Control, Tests, Test equipment, Propellant properties, *Rocket fuels, Motion, Reduction.

Damping effectiveness of a new type of fuel-sloshing baffle is presented in terms of measured

frequency response of a cylindrical tank undergoing forced translational motion. The results are given in the form of damping ratio, fundamental natural frequency, and coupled frequency so that the dynamic response functions which represent fuel dynamics are defined. The baffle by virture of its asymmetrical form is shown to couple the fundamental sloshing mode with the second symmetrical mode in such a way that the effective damping is considerably higher than the damping of conventional ring-type baffles of equal area. (Author)

AD-260 082 Div. 9, 25
(25 July 61) OTS price $2.60

Dayton U. Research Inst., Ohio.
PRESSURE ENERGY EXCHANGE PRINCIPLE.
Interim technical rept. for 15 Apr 60-14 Apr 61 on Mechanics of Flight,
by John E. Minardi, Charles E. Pax, and Harold E. Wright. May 61, 24p. incl. illus.
(Contract AF 33(616)6417, Proj. 7063)
(ARL-45) Unclassified report

DESCRIPTORS: *Thermodynamics, *Compressible flow, High temperature research, *Shock tubes, Pressure, *Pressure exchangers, Test methods, Test equipment, Heating.

Pressure energy exchange principles are investigated. These studies are directed toward achieving temperatures of the order of 10,000 R in substantial amounts of uncontaminated, high pressure air, and higher temperatures in small amounts of air. A system using high pressure air to raise the temperature of a charge of air by rapid compression up to 200 atmospheres is being used for experimental studies. Also being investigated is a system which uses a column of water at velocities up to two hundred feet per second to compress a charge of air. A brief description of both systems and the preliminary results from the first few experimental tests are included in this Technical Note. A theoretical development of conditions resulting from shock heating of the charge gas is presented. (Author)

AD-260 179 Div. 9, 12
(26 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
ON THE LONG PERIOD LUNI-SOLAR EFFECT IN THE MOTION OF AN ARTIFICIAL SATELLITE,
by Peter Musen. July 61, 17p. (Technical note no D-1041)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-1041.

DESCRIPTORS: *Satellite vehicles, *Orbital flight paths, *Stability, Oscillation, Perturbation theory, Polynomials, Integral equations, Moon, Programming, Computers, Motion, Periodic variations, Satellite vehicle trajectories, Celestial mechanics.

Two systems of formulas are presented for the determination of the long period perturbations caused by the Sun and the Moon in the motion of an artificial satellite. The first system can be used to determine the lunar effect for all satellite. The second method is more convenient for finding the lunar effect for close satellites and the solar effect for all satellites. Knowledge of these effects is essential for determining the stability of the satellite orbit. The basic equations of both systems are arranged in a form which permits the use of numerical integration. The two theories are more accurate and more adaptable to the use of electronic machines than the analytical developments obtained previously (AD-249 292). (Author)

AD-260 181 Div. 9, 12
(26 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
SIMPLE FORMULAS FOR STAGNATION-POINT CONVECTIVE HEAT LOADS IN LUNAR RETURN,
by Frederick C. Grant. July 61, 21p. incl. illus.
(Technical note no. D-890)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-890.

DESCRIPTORS: *Lunar probes, Atmosphere entry, *Re-entry aerodynamics, *Aerodynamic heating, Lift, Drag, Re-entry vehicles, Control systems, Mathematical analysis, Flight paths.

Simple formulas are given for the stagnation-point convective heat loads in lunar return for two operational modes. The two modes of operation analyzed are typical of moderate heating and of nearly minimum heat loads, respectively. The values of the parameters in a simple two-parameter formula for the total-heat load are given in the lift-drag-ratio range of 0.2 to 1.0 and in the peak loading range of 2g to 10g. For vehicles having a lift-drag ratio near 0.5, which is typical of many proposed lunar return vehicles, the nominal mode had about 20 percent more absorption than the nearly minimum mode. (Author)

AD-260 302 Div. 9
(28 July 61) OTS price $6.60

Polytechnic Inst. of Brooklyn, N. Y.
ON TURBULENT FREE MIXING OF PARALLEL STREAMS OF TWO DIFFERENT GASES,
by Shigeo Uchida. June 61, 59p. incl. illus. tables (PIBAL rept. no. 635)
(Contract AF 49(638)217, Proj. 9781)
(AFOSR-966) Unclassified report

DESCRIPTORS: *Turbulent flow, *Jet mixing flow, Diffusion, Thermodynamics, *Compressible flow, Shear stresses, Enthalpy, Viscosity, Transformations (Mathematics), Differential equations, Integration, Tables.

A theoretical investigation of the turbulent mixing of two different nonreacting gases is presented. Four different equations for predicting the mixing are derived by considering combinations of two different formulations of the turbulent transport currents of mass, momentum and energy, and two different formulations of the eddy kinematic viscosity coefficient in compressible flow. All equations can be solved numerically to yield similar type solutions. The results of a numerical calculation comparing the solutions given by the four equations is presented. (Author)

Division 9 - FLUID MECHANICS

AD-260 391 Div. 9, 22
(31 July 61) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
HYDRA PROGRAM. UNDERWATER EXPLOSION BUBBLE'S TIME HISTORY,
by M. Kaltwasser. 2 June 61, 21p. (Rept. no. NRDL-TR-513)

Unclassified report

DESCRIPTORS: *Underwater explosions, Simulation, *Explosion bubbles, *Fluid mechanics, Shock waves, Detonation waves, Hydrodynamics.

A brief description of the physical phenomena - gas bubble, shock wave, and water flow - arising from an underwater spherical chemical detonation, along with a critique of past work on the subject is presented. Assuming a non-steady, irrotational, compressible, unbounded water flow in a zero gravitational field, and using appropriate fluid dynamic and certain assumed thermodynamic relations, the exact equation for the water potential function F is derived. The general solution, F(r,t), is discussed, and two particular solutions, with boundary conditions applied, are presented for the bubble radius a(t) up to the time of first maximum radius. (Author)

AD-260 428 Div. 9
(1 Aug 60) OTS price $9.10

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF HIGH-SPEED PARTICLE EROSION OF MELTING AERODYNAMIC SURFACES.
Final rept.,
by E. W. Ungar. 15 Sep 59, 1v. incl. illus. tables.
(Contract DA 33-019-ORD-2774)

Unclassified report

DESCRIPTORS: *Re-entry aerodynamics, *Guided missile noses, *Ablation, Cooling, Particles, Moisture, Clouds, Jet engines, Ice, Water, Guided missiles, Tests, Experimental data, *Meteorology, Test methods.

The impact of atmospheric moisture particles on ablating hypersonic bodies was studied experimentally and theoretically. Various factors involved in the simulation of impacts with atmospheric-moisture particles during re-entry are discussed. The phenomena was studied experimentally in a rocket exhaust jet using small solid and liquid particles to simulate atmospheric moisture. Factors which could not be simulated in the rocket-exhaust-jet tests were analyzed theoretically. The experimental data were correlated using a mechanism based on the dissipation of particle energy in the melt layer. The results were extrapolated to the conditions of atmospheric re-entry. The results indicate that the ablation rate on a nose cone following a 3000 NM trajectory increases by a factor of 2 during flight through a cloud as a result of impacts with fine ice particles or water droplets. (Author)

AD-260 504 Div. 9
(1 Aug 61) OTS price $5.60

Hydronautics, Inc., Rockville, Md.
THE LINEARIZED THEORY FOR SUPERCAVITATING HYDROFOILS OPERATING AT HIGH SPEEDS NEAR A FREE SURFACE,
by J. Auslaender. 8 June 61, 58p. incl. illus. 14 refs. (Technical rept. 001-5)
(Contract NObs-78396)

Unclassified report

DESCRIPTORS: *Hydrofoils, Hydrodynamics, Cavitation, Lift, Drag, Moments, Pressure, Airfoils, Linear systems, Theory, Perturbation theory, Mathematical analysis.

Linearized cavity flow theory, in conjunction with a mapping technique, is used to develop general expressions for the characteristics of supercavitating or fully ventilated, two dimensional hydrofoils with prescribed pressure distributions, designed for operation near a free surface. It is assumed that the hydrofoils are operating at zero cavitation number and that the Froude number - based on depth - is very large. The general expressions are used to derive the lift, cavity drag and shape of hydrofoils composed of 2-, 3-, and 5-term and constant pressure camber configurations, combined with angle of attack and quasi-parabolic thickness and designed for operation at specific depths. Examples of numerical results are given and the effect of foil strength is discussed and evaluated. (Author)

AD-260 509 Div. 9
(3 Aug 61) OTS price $6.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A THEORY FOR THE LAMINAR SUBLAYER OF A TURBULENT FLOW,
by Joseph Sternberg. Apr 61, 67p. incl. illus. 25 refs. (BRL rept. no. 1127)

Unclassified report

DESCRIPTORS: *Laminar boundary layer, *Gas flow, *Turbulent flow, Fluid mechanics, Differential equations, *Turbulent boundary layer, Mathematical analysis, Motion, Equations.

A simplified linearized form of the equations of motion for the turbulent fluctuations is used to describe the turbulent field between the wall and the fully turbulent part of the flow. The mean flow in the sublayer and the turbulence field outside the sublayer are assumed to be known from the experiments. The thickness of the sublayer arises naturally in the theory and is directly analogous to the inner viscous region for the fluctuations in a laminar flow. It is shown that the large scale fluctuations containing most of the turbulent energy are convected downstream with a velocity characteristic of the middle of the boundary layer. Thus Taylor's hypothesis does not apply to these large scale fluctuations near the wall. The convective velocity found in the measurements of pressure fluctuations at the boundaries of turbulent flows is in accord with the theory. Calculations are given for the energy spectra and u' fluctuation level in the sublayer and other aspects of the fluctuation field are discussed. It is shown that the production of turbulent energy is a maximum where the laminar shearing stress is equal to the turbulent shearing stress. (Author)

AD-260 540 Div. 9, 15
(2 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
NUMERICAL SOLUTIONS FOR SUPERSONIC FLOW OF AN IDEAL GAS AROUND BLUNT TWO-DIMENSIONAL BODIES,
by Franklyn B. Fuller. July 61, 47p. incl. illus. tables (Technical note no. D-791)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-791.

DESCRIPTORS: Numerical analysis, *Numerical methods and procedures, *Supersonic flow, *Aerodynamic configurations, *Blunt bodies, Fluid mechanics, Gas flow, Shock waves.

The method described is an inverse one; the shock shape is chosen and the solution proceeds downstream to a body. Bodies blunter than circular cylinders are readily accessible, and any adiabatic index can be chosen. The lower limit to the free-stream Mach number available in any case is determined by the extent of the subsonic field, which in turn depends upon the body shape. Some discussion of the stability of the numerical processes is given. A set of solutions for flows about circular cylinders at several Mach numbers and several values of the adiabatic index is included. (Author)

AD-260 541 Div. 9
(2 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STABILITY AND CONTROL CHARACTERISTICS OF A SMALL-SCALE MODEL OF AN AERIAL VEHICLE SUPPORTED BY TWO DUCTED FANS,
by Lysle P. Parlett. July 61, 22p. incl. illus. (Technical note no. D-920)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-920.

DESCRIPTORS: *Flying platforms, Shrouded, propellers, Control, *Stability, *Aerodynamics, Stabilization, Control surfaces, Damping, Roll, Pitch, Moments, Jets, Guide waves, Aerodynamic configurations, *Vertical take-off planes, Reconnaissance planes, Transport planes, Model tests.

Tests were made with the ducted fans arranged tandem and side by side. The model was found to be dynamically unstable in roll and pitch in both hovering and forward flight, but this instability could be eliminated by the addition of a sufficient amount of artificial damping. A system of longitudinal vanes just below the duct exists was found to be unsatisfactory as a source of roll-control moment. Less pitch-control moment was required for the tandem arrangement than for the side-by-side arrangement at any given forward speed. (Author)

AD-260 634 Div. 9
(7 Aug 61) OTS price $3.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
ON A METHOD FOR MEASURING THE BASE PRESSURE. MEASUREMENT AND VISUALIZATION ON A CONE CYLINDER MAGNETICALLY SUSPENDED AT M SUB ZERO APPROXIMATELY EQUAL TO 7.6,
by Georges Dubois and Charles Rouge, tr. by R. N. Zapata. May 61, 36p. incl. illus. tables. (Rept. no. AST-4443-102-61U, trans. of La Recherche Aeronautique 79, Nov-Dec 60) (AFOSR-1020) Unclassified report

DESCRIPTORS: *Gas flow, Hypersonics, *Hypersonic flow, Shock waves, Magnetic fields, *Conical bodies, Cylindrical bodies, Visibility, Pressure, Measurement, Test methods, Model tests.

This analysis is concerned with a method for measuring the base pressure of an axially symmetrical body. This method avoids material supports through the use of the magnetic suspension O.N.E.R.A. for keeping the model on the axis of the stream at the test section. Thus, the base pressure is measured, with no interactions, by means of an optical manometer located inside the model. At the same time, the flow can be visualized by a schlieren system. This analysis specifies the conditions required for the applicability of the method, analyzes the precision of the measurements, discusses the results obtained with and without sting, and compares them to those previously obtained at lower Mach numbers. (Author)

AD-260 635 Div. 9, 25
(3 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
GROUND MEASUREMENTS OF THE SHOCK-WAVE NOISE FROM SUPERSONIC BOMBER AIRPLANES IN THE ALTITUDE RANGE FROM 30,000 to 50,000 FEET,
by Domenic J. Maglieri and Harvey H. Hubbard. July 61, 24p. incl. illus. table (Technical note no. D-880)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-880.

DESCRIPTORS: *Shock waves, Pressure, Measurement, *Supersonic planes, *Jet bombers, Transonics, *Lift, Aerodynamics, Gas flow, Bombers.

Shock-wave ground-pressure measurements have been made for supersonic bomber airplanes in the Mach number range from 1.24 to 1.52, for altitudes from about 30,000 to 50,000 feet, and for a gross-weight range from about 83,000 to 120,000 pounds. The measured overpressures were generally higher than would be predicted by the theory which accounts only for volume effects. There is thus a suggestion that lift effects on sonic-boom intensity may be significant for this type of airplane for the altitude range of the present tests. (Author)

AD-260 636 Div. 9, 25
(3 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
AN INVESTIGATION OF THE INFLUENCE OF LIFT ON SONIC-BOOM INTENSITY BY MEANS OF WIND-TUNNEL MEASUREMENTS OF THE PRESSURE FIELDS OF SEVERAL WING-BODY COMBINATIONS AT A MACH NUMBER OF 2.01,
by Harry W. Carlson. July 61, 37p. incl. illus. tables (Technical note no. D-881)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-881.

DESCRIPTORS: *Shock waves, *Lift, Aerodynamics, Wind tunnels, *Wing-body configurations, Pressure, Acoustics, *Sound, *Supersonic flow, Gas flow.

An investigation of the effect of lift on sonic-boom intensity was performed by means of wind-tunnel measurements of the pressure fields surrounding small wing-body combinations. Effects of lift were found to be real and significant. Measured bow-shock intensities agreed fairly well with, but were consistently less than, shock intensities estimated by theoretical methods. Available flight data were examined for correlation with wind-tunnel test results. (Author)

Division 9 - FLUID MECHANICS

AD-260 640 Div. 9
(3 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF LOW-ASPECT-RATIO WINGS IN CLOSE PROXIMITY TO THE GROUND,
by Marvin P. Fink and James L. Lastinger. July 61, 37p. incl. illus. (Technical note no. D-926)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-926.

DESCRIPTORS: *Wings, *Ground effect, Lift, Drag, Moments, Stability, *Aerodynamics, Subsonic flow, Aspect ratio.

A wind-tunnel investigation has been conducted to determine the effect of ground proximity on the aerodynamic characteristics of thick highly cambered rectangular wings with aspect ratios of 1, 2, 4, and 6. The results showed that, for these aspect ratios, as the ground was approached all wings experienced increases in lift-curve slope and reductions in induced drag which resulted in increases in lift-drag ratio. Although an increase in lift-curve slope was obtained for all aspect ratios as the ground was approached, the lift coefficient at an angle of attack of 0 degrees for any given aspect ratio remained nearly constant. The experimental results were in general agreement with Wieselsberger's ground-effect theory. As the wings approached the ground, there was an increase in static longitudinal stability at positive angles of attack. When operating in ground effect, all the wings had stability of height at positive angles of attack and instability of height at negative angles of attack. Wing-tip fairings on the wings with aspect ratios of 1 and 2 produced small increases in lift-drag ratio in ground effect. (Author)

AD-260 641 Div. 9, 1
(3 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
BOUNDARY-LAYER TRANSITION ON A GROUP OF BLUNT NOSE SHAPES AT A MACH NUMBER OF 2.20,
by Mary W. Jackson and K. R. Czarnecki. July 61, 21p. incl. illus. table (Technical note no. D-932)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-932.

DESCRIPTORS: *Boundary layer, *Bodies of revolution, Blunt bodies, *Gas flow, Turbulence, Turbulent boundary layer, Fluid mechanics, Supersonic flow.

The boundary-layer transition on six axisymmetrical blunt bodies of revolution was studied. Model shapes were selected with respect to the degree of favorable pressure gradient over the model surface. Tests were conducted at a Mach number of 2.20 and over a range of free-stream Reynolds number per foot of about 1.4 x 10 to the 6th power to 6.5. The tests were made at an angle of attack of 0 deg. with zero heat transfer. For the hemisphere, the flow remained essentially laminar over the model surface length for the entire pressure range of the tests. For a strong favorable pressure gradient followed by any weak favorable, neutral, or adverse gradient, the tendency was for transition to occur at or immediately behind the shoulder. A single strip of three-dimensional roughness in the region of strong favorable pressure gradient did not fix transition on the models at the roughness location except at the maximum test pressures, whereas a second roughness strip added in a region of neutral or adverse pressure gradient did fix transition. (Author)

AD-260 642 Div. 9, 1
(4 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
EFFECTS AT MACH NUMBERS OF 1.61 AND 2.01 OF CAMBER AND TWIST ON THE AERODYNAMIC CHARACTERISTICS OF THREE SWEPT WINGS HAVING THE SAME PLANFORM,
by Emma Jean Landrum and K. R. Czarnecki. Aug 61, 48p. incl. illus. (Technical note no. D-929)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-929.

DESCRIPTORS: *Aerodynamics, *Swept-back wings, Wings, Lift, Drag, Stability, Control.

An investigation has been made at Mach numbers of 1.61 and 2.01 to determine the aerodynamic characteristics of three wings having a sweepback of 50 degrees at the quarter-chord line, a taper ratio of 0.20, an NACA 65A005 thickness distribution, and an aspect ratio of 3.5. One wing was flat, one had at each spanwise station an a equals 0 mean line modified to have a maximum height of 4% chord, and one had a linear variation of twist with 6 degrees of washout at the tip. When compared with the flat wing, the effect of the linear variation of twist with 6 degrees of washout at the tip was to increase the lift-drag ratio when the leading edge was subsonic; but little increase in lift-drag ratio was obtained when the leading edge was supersonic. Pitching moment was increased and gave a positive trim point without greatly affecting the rate of change of pitching moment with lift coefficient. For the cambered wing the high minimum drag resulted in comparatively low lift-drag ratios. In addition, the pitching moments were decreased so that a negative trim point was obtained. (Author)

AD-260 718 Div. 9, 25
(7 Aug 61) OTS price $4.60

Polytechnic Inst. of Brooklyn, N. Y.
THEORETICAL ANALYSIS OF THE DOWNSTREAM INFLUENCE OF STAGNATION POINT MASS TRANSFER.
Rept. for Feb 60-May 61 on Experimental Techniques for Materials Research (and) Research on Aerodynamic Flow Fields,
by Robert J. Cresci. June 61, 34p. incl. illus. (Contracts AF 33(616)5944, Proj. 7364 and AF 33(616)7661, Proj. 7064)
(WADD TR 60-434) Unclassified report

DESCRIPTORS: Diffusion, Boundary layer, Heat transfer, *Gas flow, Enthalpy, Sweat cooling, Coolants, Injection, Blunt bodies, *Hypersonic flow, *Aerodynamic heating, Differential equations, Mathematical analysis.

The integral method has been applied to determine the downstream influence of homogeneous mass transfer in the stagnation region of a blunt, axisymmetric body under hypersonic flight conditions. Exponential profiles are employed in

an attempt to eliminate singularities which have appeared in previous analyses utilizing polynomial profiles. These singularities arise in the presence of a favorable pressure gradient when the density at the surface is comparable to that in the external stream. The results indicate that the singularities occurring in the application of the integral method using polynomial profiles do not arise in the present analysis utilizing exponentials. The heat transfer rates obtained are compared to experimental data and are found to predict the downstream effect of the mass injection reasonably well if the results are normalized with respect to the zero mass transfer prediction. The effect, on the heat transfer rates, of varying the coolant temperature and the injection area are also investigated. It is found that decreasing the coolant temperature or increasing the injection area result in a decrease in the peak heat rate and over-all heat transferred to the body. (Author)

AD-260 719 Div. 9
(7 Aug 61) OTS price $8.10

Princeton U., N. J.
DYNAMIC STABILITY ANALYSIS OF A VTOL VECTORED SLIPSTREAM VEHICLE DURING TRANSITION,
by Guy A. Williamson. Apr 61, 90p. incl. illus. tables (Rept. no. 535)
(Contracts Nonr-185814, Proj. NR 212-000 and Nonr-185801)

Unclassified report

DESCRIPTORS: *Vertical take-off planes, Aerodynamics, Stability, Mathematical analysis, Differential equations, Digital computers, Velocity.

The six equations of motion appropriate for the vectored slipstream aircraft during transition are developed and examined numerically on the LGP-30 digital computer. The characteristic roots of these equations are calculated and presented as a function of forward velocity during typical transition maneuvers. The variations of these stability roots with respect to changes in various basic aircraft physical and aerodynamic parameters are also given. (Author)

AD-260 761 Div. 9
(7 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LOW-SUBSONIC MEASUREMENTS OF THE STATIC STABILITY AND CONTROL AND OSCILLATORY STABILITY DERIVATIVES OF A PROPOSED REENTRY VEHICLE HAVING AN EXTENSIBLE HEAT SHIELD FOR HIGH-DRAG REENTRY,
by Joseph L. Johnson, Jr., and Peter C. Boisseau. Aug 61, 35p. incl. illus. (NASA-TN-D-892)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-892.

DESCRIPTORS: Aerodynamics, *Stability, Subsonic flow, *Control systems, *Re-entry vehicles, *Re-entry aerodynamics, Drag, Aerodynamic heating, Aerodynamic configurations, Model tests.

A low-speed investigation has been made to determine the static and oscillatory longitudinal and lateral stability derivatives of a proposed reentry vehicle having an extensible heat shield for reentry at high angles of attack. The heat shield is extended forward to give the desired aerodynamic-center position of high-angle-of-attack reentry and, after completion of the reentry phase, is retracted to give stability and trim for gliding flight at low angles of attack. Near an angle of attack of 90 degrees the reentry configuration was statically stable both longitudinally and directionally, had positive dihedral effect, and had positive damping in roll but zero damping in yaw. The landing configuration had positive damping in pitch, roll, and yaw over the test angle-of-attack range but was directionally unstable and had negative dihedral effect between an angle of attack of about 10 and 20 degrees. (Author)

AD-260 762 Div. 9
(7 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
ESTIMATE OF SHOCK STANDOFF DISTANCE AHEAD OF A GENERAL STAGNATION POINT,
by Eli Reshotko. Aug 61, 20p. incl. illus.
(NASA TN-D-1050)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA TN-D-1050.

DESCRIPTORS: Boundary layer, *Shock waves, *Gas flow, Rings, Blunt bodies, Bodies of revolution, Cylindrical bodies, Integration, Numerical analysis, Hypersonic flow.

The shock standoff distance ahead of a general rounded stagnation point has been estimated under the assumption of a constant-density shock layer. It is found that, with the exception of almost-two-dimensional bodies with very strong shock waves, the present theoretical calculations and the experimental data of Zakkay and Visich for toroids are well represented by the relation

$$\frac{\Delta_{3D}}{R_{s,x}} = \left(\frac{\Delta_{ax\ sym}}{R_s}\right)\left(\frac{2}{K+1}\right)$$

where Δ is the shock standoff distance, $R_{s,x}$ is the smaller principal shock radius, and K is the ratio of the smaller to the larger of the principal shock radii. (Author)

AD-260 764 Div. 9, 25
(7 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
SKIN STRESSES IN AN INFLATED SPHERE DURING IMPACT,
by E. Dale Martin. Aug 61, 34p. incl. illus.
(NASA TN-D-1070)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-1070.

DESCRIPTORS: *Spheres, *Impact shock, Pneumatic devices, Stresses, *Landing impact, Mathematical analysis.

An analysis is made of the stresses in the skin of an inflated nonstretchable sphere during normal, nonrotating impact with a hard flat surface, assuming infinite modulus of elasticity in the skin and infinite propagation speed of stress

waves. The analysis is further applied to the study of the inflated sphere landing vehicle containing a payload suspended at the center. Curves are presented showing the stress distributions during impact for cases corresponding to those calculated in previous reports in which the impact motion and payload landing performance capabilities of the landing vehicle have been studied. (Author)

AD-260 778 Div. 9
(7 Aug 61) OTS price $4.60

Stanford U., Calif.
THE PLANE TURBULENT WALL JET. PART I. JET DEVELOPMENT AND FRICTION FACTOR,
by G. E. Myers, J. J. Schauer, and R. H. Eustis. 1 June 61, 42p. incl. illus. tables, 15 refs. (Technical rept. no. 1)
(NSF Grant 9705)
Unclassified report

DESCRIPTORS: *Jets, Deflection, *Aerodynamics, Tests, Experimental data, Heat transfer, *Viscosity, Shear stresses, Turbulent flow, Velocity, Thickness, Mathematical analysis, Differential equations, Integral equations, Sheets.

An investigation was made of the jet development, the velocity profiles, and the wall shearing stress in a two-dimensional, incompressible, turbulent wall jet. Experimental data concerning velocity profiles, decay of the maximum velocity and the jet growth are presented over greater ranges than previously available. The shearing stress, maximum velocity decay and jet thickness are predicted analytically by momentum-integral methods and the shear stress is measured experimentally by a hot-film technique. The hot-film values are checked by the wall shear stress computed from the measured velocity profiles. Velocity profiles, velocity decay, and jet thickness agree well with previous investigators and the wall shear stress measurements help to resolve a wide divergence between the experimental values of the other investigators. (Author)

10. FUELS AND COMBUSTION

AD-260 040 Div. 10, 27
(21 July 61) OTS price $3.60

Princeton U., N. Y.
COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKET MOTORS.
Progress rept. no. 35, 1 Nov 60-31 May 61, by David T. Harrje and Frederick H. Reardon, 1 June 61. 40p. incl. illus. (Aeronautical engineering rept. no. 216-ii)
(Contract NOw 61-0686-d; Continuation of Contract NOa(s) 60-6078-c)
Unclassified report

DESCRIPTORS: *Rocket motors, *Liquid rocket propellants, *Combustion, Jet acoustic oscillators, Stability, Fuel injectors, Fuel injection, Design, Theory, Rocket motor nozzles, Ethylene oxide.

Starting problems involving the loss of flame from the solid propellant ignitor have caused three explosions on the 500-lb. thrust tests (tangentially oriented 1.4 spuds). The flame holding effect of the solid propellant ignitor is very critical with this injector despite the starting mixture of H-O. The variable-length sector motor was used over a wide range of mixture ratios and lengths. No instability was observed. Nozzle conditions in the longitudinal testing limited the regions of instability. Effects of variable sector angle above 180 degrees were investigated using iso-octane as a check against the alcohol-liquid O results. Angles above 180 degrees definitely introduce error. The interaction index varies markedly with mixture ratio for iso-octane.

AD-260 067 Div. 10
(24 July 61) OTS price $1.60

TAPCO West Coast Engineering, Thompson Ramo Wooldridge, Inc., Inglewood, Calif.
INVESTIGATION OF AUTOIGNITION AND OTHER PHENOMENA IN HIGH TEMPERATURE AIRCRAFT FUEL SYSTEMS.
Progress rept. no. 4, 15 Feb-15 Apr 61, by R. G. Wolfshagen, 1 May 61, 11p. incl. illus. table (Engineering rept. no. ING ER 301)
(Contract AF 33(616)7137, Proj. 3084)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, Ignition, Fuel systems, *Fuel tanks, Temperature, High temperature research, Pressure, Vapors, Aerodynamic heating, Combustion, Gases, *Jet planes, Supersonic planes, Test facilities, Test methods.

A test series was initiated investigating aerodynamic heat up of fuel system vapor space in terms of pressure level, heating rate and mixture composition. Tests were conducted at pressure levels from 2 to 15 psia and with JP-6 fuel vapor-oxygen-nitorgen mixture compositions containing from 20 to 2% oxygen by volume. In all tests conducted reaction of the mixture was indicated. Significant test results include the following: (1) In tests with 2% oxygen concentration and within the pressure range investigated, reactions are predominantly of the cool flame, slow oxidation type. (2) Severity of reaction decreases considerably as the mixture becomes increasingly fuel rich. (Author)

AD-260 201 Div. 10
(18 July 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
A PRELIMINARY STUDY OF STATIONARY SHOCK-INDUCED COMBUSTION WITH HYDROGEN-AIR MIXTURES,
by R. P. Rhodes and D. E. Chriss. July 61, 39p. incl. illus. (Rept. no. AEDC TN 61-36)
(Contract AF 40(600)800, Proj. 9751)
Unclassifiedreport

DESCRIPTORS: Rocket motors, *Hydrogen, *Air, *Combustion, *Ignition, Gases, Shock waves, Fuel injection, Fuel injectors, Supersonic flow, Schlieren photography, Mixtures, Combustion chambers, Combustion chamber gases.

A study of the shock-induced combustion of hydrogen-air mixtures was made in a small Mach number 3 wind tunnel at a total pressure level of 45 psia. Combustion was induced by a normal shock wave which resulted from the interaction of two oblique shock waves produced by wedges on the tunnel walls. Significantly different phenomena were observed when the fuel injector was moved from the subsonic portion of the nozzle into the

throat. With fuel injection in the throat, ignition denoted by emission glow from the sodium introduced with the hydrogen did not occur until some distance downstream of the normal shock wave. Some data are presented showing this delay as a function of the static temperature behind the shock wave. (Author)

AD-260 333 Div. 10
(31 July 61) OTS price $11.00

Bell Aerosystems Co., Buffalo, N. Y.
TITAN II STORABLE PROPELLANT HANDBOOK. FINAL HANDBOOK.
Rept. no. 3 (Final). 15 June 60-15 Apr 61, on Storable Propellant Data for the Titan II Program, by Ralph R. Liberto. June 61, 145p. incl. illus. tables, 45 refs.
(Contract AF 04(611)6079, Proj. 6753)
(AFFTC TR 61-32) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Methyl hydrazines, Nitrogen compounds, *Rocket oxidizers, *Tetroxides, *Hydrazines, Rocket fuels, Storage, Handling, Hazards, Safety, Combustion, Explosions, Ignition, Physical properties, Metals, Plastics, Elastomers, Lubricants, Adhesives, Ceramic materials, Alloys, Sealing compounds, Materials, Packaging, Coatings, Deterioration, *Handbooks.

Summarized are the physical properties, materials compatibility, handling techniques, flammability and explosivity, and procedures for storing, cleaning, and flushing of the Titan II propellants. These propellants consisted of N_2O_4 as the oxidizer and a nominal 50/50 blend of UDMH (unsymmetrical dimethylhydrazine) and N_2H_4 as the fuel. The data presented were derived both from a literature survey and from a test program conducted at Bell Aerosystems Company and at the U.S. Bureau of Mines. (Author)

AD-260 393 Div. 10, 25
(31 July 61) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
FINITE-DIFFERENCE SOLUTION OF AXISYMMETRIC ELASTIC STRESS STATE IN SOLID PROPELLANT FOR TWO LOADING CONDITIONS,
by Ralph E. Hubka. May 61, 42p. incl. illus.
(Rept. no. 7106-0038-NU-000)
(Contract AF 04(647)619)
(AFBMD TN 61-40) Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Rocket motors, *Rocket cases, Stresses, *Elasticity, Deformation, Gravity, Acceleration, Shear stresses, Loading, Mathematical analysis, Digital computers, Differential equations, Integral equations, Theory.

The axisymmetric stress state which may occur in the solid propellant of rockets, prior to the period of firing, has been investigated by the application of an elastic, finite-difference analysis to a simplified configuration of the propellant. Two loading conditions, (1) differential expansion of the propellant and case and (2) gravitational forces acting on the propellant, are considered. The results indicate that the first loading condition produces a stress state in which there is a rapid increase in the shear stress along the interface, toward the open end of the propellant. The maximum shear stress produced by the second loading condition is essentially equal to that given by the approximate solution of Seide (Stresses in Solid Rocket Propellants, Due to High Accelerations. Ramo-Wooldridge Corp. Memo, RW-66-126, 1955). With propellant/length ratios much shorter than that of the present problem, the results most likely would be modified. (Author)

AD-260 402 Div. 10, 4, 27
(31 July 61) OTS price $1.60

James Forrestal Research Center, Princeton U., N. J.
BIBLIOGRAPHY OF UNCLASSIFIED SQUID PUBLICATIONS 1 JUNE 1959 TO 1 JUNE 1961 (SUPPLEMENT C).
July 61, 16p. (Suppl. C to Proj. Squid Technical rept. no. PR-67-P, AD-112 552)
(Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Bibliography, Fluid flow, Reactor kinetics, Thermodynamics, Thermochemistry, Ignition, Detonation waves, Flame propagation, Flames, Temperature, Measurement, Pressure, Stability, *Jet propulsion, Combustion.

AD-260 404 Div. 10, 22
(1 Aug 61) OTS price $5.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
ESTABLISHMENT OF IMPROVED STANDARDS FOR CLASSIFICATION OF EXPLOSIVES AND PROPELLANTS. I. A METHOD FOR DETERMINATION OF SUSCEPTIBILITY OF PROPELLANTS AND EXPLOSIVES TO UNDERGO TRANSITION FROM DEFLAGRATION TO DETONATION.
by S. Wachtell, C. E. McKnight, and L. Shulman.
June 61, 57p. incl. illus. tables, 11 refs.
(Technical rept. no. DB-TR: 3-61)
(Proj. 7503-0100)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellants, *Explosives, *TNT, *RDX, *Detonation, Ignition, Combustion, Shock resistance, Pressure, Classification, Hazards, Handling, Test methods, Theory, Mathematical analysis, Test equipment, Tests.

A new approach to the classification of high energy propellants and explosives according to their susceptibility to undergo transition to detonation shows promising results. The method involves the burning of large solid cylinders of the material under consideration in a closed bomb at high pressure. At a pressure which is characteristic for each composition and condition, the burning rate vs. pressure curve obtained shows a marked deviation from the results predicted from strand burning tests. This deviation is indicative of a pre-detonation reaction which takes place in the explosive and which could proceed into detonation if sufficient material were available. Two secondary explosives and a number of rocket propellants were tested. (Author)

AD-260 407 Div. 10
(31 July 61) OTS price $4.60

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
DISTURBANCES AT THE SURFACE OF BURNING SOLID PROPELLANTS,
by G. A. Agoston. 24 Apr 61, 36p. incl. illus. tables, 22 refs. (Technical note no. 1)
(Contract AF 49(638)565, Proj. 4759)
(AFOSR-915)
(ARPA Order no. 24-60, Task 2)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Combustion, Stability, *Shock waves, Flames, Propagation, Jet acoustic oscillations, *Liquid rocket propellants, Nitrates, Ethyl radicals, Photographic analysis, Schlieren photography, Hydrodynamics, Test equipment, Shock tubes.

A study was initiated of the changes in conditions near the surface of burning liquid ethyl nitrate following the impact of a weak plane shock wave (amplitude 0.5 psi) moving in a direction normal to the surface. The technique employed the schlieren photography of a plane probe wave introduced in a direction parallel to the burning surface. The preliminary data obtained suggest an influence on the flame structure by the normal wave between 109 and 230/microseconds following the impact. (Author)

AD-260 545 Div. 10, 12
(2 Aug 61) OTS price $8.60

Little, Arthur D., Inc., Cambridge, Mass.
LIQUID PROPELLANT LOSSES DURING SPACE FLIGHT.
Quarterly progress rept. no. 2.
May 61, 84p. incl. illus. 31 refs. (Rept. no. 63270-00-02)
(Contract NAS5-664)
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Space environmental conditions, Storage, Thermal radiation, Thermal insulation, Cratering, Impact shock, Ionization, Radiation damage, Heat transfer, *Space flight, Meteors, Propellant tanks, Spallation, Satellite vehicles, Hazards, Hypervelocity vehicles, Thermal conductivity.

Contents:
Thermal interaction studies
Theoretical aspects re the behavior of multiple-foil radiation shielding
Analytic studies of thermal protection systems
Experimental study of multilayer radiation shielding insulation
Interactions with meteoroid environment
The evaluation of meteor bumpers
The impact of pellets with thin plates
Other protection systems
Effects of ionizing radiation
The calculation of radiation dose rates
Effect of proton sputtering of absorptivity and emissivity of reflecting surfaces
Embrittlement of structural materials
Effect of hydrogen diffusion on vacuum insulation
Radiation-induced desorption of adsorbed gases

AD-260 725 Div. 10
(8 Aug 61) OTS price $2.60

Aeronutronic, Newport Beach, Calif.
STUDY OF DETONATION BEHAVIOR OF SOLID PROPELLANTS.
Quarterly rept. no. 15,
by M. H. Boyer and R. A. Grandey. 28 July 61, 24p. incl. illus. table (Publication no. U-1323)
(Contract NOrd-17945)
Unclassified report

DESCRIPTORS: *Detonation, Mathematical analysis, Equations, Chemical reactions, Reaction kinetics, Pressure, Heat, Equations of state, *Solid rocket propellants, *Propellant grains, Computers, Programming, Thermal radiation, Detonation waves, Theory, Velocity.

A summary is presented of the present formulation of the difference equations which form the basis of the one- and two-dimensional computer programs for pressure-initiated detonation. Since information on the chemical and physical behavior of actual propellants under detonation conditions is very limited, provision has been made for maximum flexibility in the form of the rate equations and the equations of state. A calculation has been carried out to determine the detonability of a composite propellant, the properties of which conform to experimental data on reaction kinetics and equations of state published by other investigators. The material was found to be non-detonable under the particular initial conditions assumed for the problem. (Author)

AD-260 726 Div. 10, 30
(8 Aug 61) OTS price $2.60

Atlantic Research Corp., Alexandria, Va.
MECHANISM OF FIRE EXTINGUISHMENT BY ALKALI METAL SALTS.
Final rept.,
by Raymond Friedman and Joseph B. Levy.
31 July 61, 26p. incl. illus. tables (Technical rept. no. 1)
(Contract NAopr-24-60, Proj. NR 051-421)
Unclassified report

DESCRIPTORS: *Fire extinguishers, Methanes, *Combustion, Hydrocarbons, *Alkali metals, *Alkali metal compounds, Sodium, Sodium compounds, Potassium, Amides, Liquid metals, Vaporization, Flames, Gases, Air, Test equipment, Test methods, Materials.

The mechanism of the inhibition of hydrocarbon-air flames by alkali-metal salts was investigated. The approach to this problem involves study of the combustion of simple hydrocarbons such as methane to which known concentrations of alkali-metal salts or the metals themselves in the vapor state have been added. An apparatus was constructed permitting the preheating of methane plus various additives to 500 C, with subsequent combustion as either a laminar premixed flame or laminar diffusion flame. Preliminary experiments were performed with flames involving CH_4, H, air, O, $NaNH_2$, elemental Na, and elemental K. Definitive experiments have not yet been carried out. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-260 076 Div. 11
(20 July 61) OTS price $5.60

Office of the Chief of Ordnance, Dept. of the Army, Washington, D. C.
TRUCKS, LOGISTICAL, HIGH MOBILITY (GOER) 4X4.
15 Mar 61, 53p. incl. illus.
(Proj. no. 5W46-09-036)
Unclassified report

DESCRIPTORS: Vehicles, *Cargo vehicles, *Amphibious vehicles, Tests, Design.

AD-260 078 Div. 11, 26, 14
(25 July 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PRESENT STATUS OF SCIENTIFIC-RESEARCH WORK IN THE FIELD OF IMPROVEMENT OF TIRE QUALITY AND THE ECONOMIC LEVEL OF TIRE PRODUCTION (Der Gegenwartige Stand der Wissenschaftlichen Forschungsarbeiten am Gebiete der Steigerung der Reifenbeschaffenheit und des Okonomischen Niveaus der Reifenproduktion).
Feb 60, 91p. incl. illus. tables (Trans. no. F-TS-9997/V)
Unclassified report

DESCRIPTORS: *Tires, Design, Manufacturing methods, Production, Rubber, Vulcanization, Physical properties, Quality control, Vulcanizates, Mixtures, Organic compounds, Cordage.

AD-260 322 Div. 11, 5
(31 July 61) OTS price $7.60

Army Transportation Board, Fort Eustis, Va.
ENVIRONMENTAL OPERATION. TROPICAL WET, 1960.
1960, 74p. incl. illus. tables (Rept. no. TCB-61-043-EO)
Unclassified report

DESCRIPTORS: *Tropical regions, *Transportation, *Air transportation, *Cargo vehicles, Helicopters, Ecology, Heat, Physiology, Personnel, Meteorological data, Transports, Aircraft equipment, Survival kits, Tests, Vehicles, Logistics, Maintenance, Communication systems, Effectiveness, Communication equipment.

The objectives of the transportation study, were the determination of the off-road capabilities of certain items of equipment and the evaluation of Army aviation resupply, evacuation, and aerial navigation techniques used in support of a ground force operating in the tropics. Four areas which were selected as test sites exemplified various tropical environments, secondary jungle, virgin jungle, uplands or mountains, and grasslands. The operation at each area was one phase of operation TROPICAL WET. The major items of equipment tested were two cargo carriers, amphibious, five trucks; One set of Jungletrac, two transporters; and two helicopters; Tracked amphibious vehicles used in support of jungle operations were available with an undeveloped potential. Light cargo helicopters were operated in tropical environments with little loss of efficiency. Communications equipment (AN/PRC-10, AN/GRC-9) was unreliable and incapable of attaining rated ranges. Use of more powerful ground radios in conjunction with present helicopter equipment would enable a supporting aviation element to locate a ground element. Transportation support of military operations in tropical environments were possible in all seasons. Land navigation was difficult. Logistical support of ground element by an aviation element is contingent upon adequate communication between them.

AD-260 784 Div. 11
(8 Aug 61) OTS price $6.60

Southwest Research Inst., San Antonio, Tex.
THE DURABILITY AND MUD MOBILITY PERFORMANCE OF 16-20, 8 P. R., NDCC TUBELESS TIRES.
Summary rept. of Proj. 209.
30 Dec 60, 68p. incl. illus. tables (Rept. no. R. E. 16-20)
(Contract DA 23-072-ORD-1501)
Unclassified report

DESCRIPTORS: *Tires, Vehicles, Trafficability, Tests, Measurement, Test equipment.

The 16-20 tires had good wearing and riding characteristics, caused no difficulty in vehicle handling (except the steering required more effort) and were lighter in weight than the 11.00-20 tire and wheel assemblies. They did not, however, resist penetration failures satisfactorily on Gravel, Pavement and Cross-Country and had the further disadvantage of being impossible to dismount for repair or replacement from the one-piece drop center safety rims, with hand tools, after the tires had accumulated some mileage. On a slick, 1 to 2 inch depth of mud overlaying a hardpan surface, the vehicle with 11.00-20 tires appeared to have a slight advantage in being able to exert a greater drawbar pull than the vehicle equipped with the 16-20 tires. Reducing the tire pressures did not appreciably affect drawbar capabilities under these conditions. In a 12 inch depth of very soft mud, the 16-20 tires, inflated to 12 psi, had a definite advantage over the 11.00-20 tires inflated to the same pressure. (Author)

12. GUIDED MISSILES

AD-260 003 Div. 12, 17, 14
(25 July 61) OTS price $2.25

Massachusetts Inst. of Tech., Cambridge.
TEXTILE FIBERS IN HIGH TEMPERATURE APPLICATIONS.
Rept. for July 58-July 59 on Fibrous Materials for Decelerators and Structures,
by R. G. Cheatham, M. E. Shank, and S. Backer.
Feb 61, 175p. incl. illus. tables, 191 refs.
(Contract AF 33(616)5881, Proj. 7320)
(WADD TR 60-327) Unclassified report

DESCRIPTORS: *Metallic textiles, *Glass textiles, Fibers, *Parachute fabrics, *Refractory materials, Heat resistant alloys, Metals, Alloys, Metal coatings, *Refractory coatings, High temperature research, Asbestos fiber, Textiles, Synthetic fibers, Ceramic fibers, Mechanical properties, Oxidation, Re-entry vehicles, Drag, *Parachutes, Materials, Heat resistant polymers, Manufacturing methods, Bibliography.

This project involved a survey of literature in the fields of metals, polymers and glasses to ascertain the availability of fibrous materials suitable for high temperature applications in re-entry parachutes. Whereever possible, mechanical behavior of the material's fiber form was considered at the temperature level of 1500 F. But in many instances only bulk behavior of the material in question has been reported with an indication of its fabricating problems. There is at hand a small selection of stable, high temperature metal fibers capable of meeting the re-entry parachute requirements, although with some restrictions in weight, cost, and textile performance. (Author)

AD-260 011 Div. 12, 2
(21 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF ERROR PROGRESSION IN TERMINAL GUIDANCE FOR LUNAR LANDING,
by P. J. deFries. July 61, 27p. (NASA Technical note D-605)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-605.

DESCRIPTORS: Space flight, *Space ships, *Lunar probes, Guidance, *Deceleration, *Landing, Errors, *Rocket motors, Retro rockets, Extraterrestrial bases, Thrust, Mathematical analysis.

A lunar descent scheme with n periods of engine ON-OFF is investigated. Each period may have a different thrust level but it is constant for the length of the period. The engines are ignited by altitude and cut off by velocity signals. Five groups of errors are considered: ignition altitude, velocity change, thrust level, lunar gravitation, and initial approach velocity. Equations are derived that allow the computation of the influence of any given error occurring during any one of the n periods on the final velocity at touchdown. It is concluded that it is principally advantageous to break up the descent into ON-OFF periods. Also it is inferred, as far as guidance is concerned, that the problem of descent rests with the very last period of braking. The upper periods can always be handled with constant thrust and rather crude instrumentation whereas the instrumentation for the last period depends upon the required softness of the landing which also determines whether or not variable thrust is necessary. (Author)

AD-260 012 Div. 12, 9
(21 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
EARTH OBLATENESS AND RELATIVE SUN MOTION CONSIDERATIONS IN THE DETERMINATION OF AN IDEAL ORBIT FOR THE NUMBUS METEOROLOGICAL SATELLITE,
by William R. Bandeen. July 61, 10p. incl. illus. (NASA Technical note D-1045)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-1045.

DESCRIPTORS: *Satellite vehicles, Orbital flight paths, Determination, Aerodynamic data, Earth, Gravity, Sun, Motion, Theory.

It is desired that the Nimbus meteorological satellite always cross the equator around local noon and, half-an-orbit later, cross the equator in the other direction around local midnight. The application of the phenomenon of nodal regression toward this end is discussed, and an analysis of the parameters angles of inclination, periods, and heights of such ideal circular orbits is presented. Also, the relative motion of the apparent versus the fictitious mean sun is briefly discussed. (Author)

AD-260 058 Div. 12
(21 July 61) OTS price $8.10

Rand Corp., Santa Monica, Calif.
LUNAR INSTRUMENT CARRIER. TRAJECTORY STUDIES,
by H. A. Lieske. 4 June 56, rev. 25 June 58, 83p. incl. illus. 11 refs. (Research memo. no. RM-1728)
Unclassified report

DESCRIPTORS: *Lunar probes, Astronautics, *Orbital flight paths, Earth, Mathematical analysis, Radio equipment, Hypervelocity vehicles, Moon, Velocity, Instrumentation, Landing, Landing impact, Satellite vehicles, Satellite vehicle trajectories.

Results are presented of a study of free-flight earth-moon trajectories, which describe the two-dimensional ballistic motion of a vehicle from a standard initial altitude above the earth to impact on the surface of the moon. Trajectories originating at various positions relative to the initial position of the moon are studied to cover the complete spectrum, including retrograde launching. A design transit trajectory is chosen to examine the effect of small variations of initial parameters on the location of the lunar impact point for use in error studies. A hit band of transit trajectories that lead to impact on the moon is computed by varying initial conditions in the vicinity of the design point. Transit trajectories in the vicinity of the design point that miss the moon are studied for use in establishing artificial satellites of the moon. (Author)

AD-260 077 Div. 12
(24 July 61) OTS price $2.60

Ordnance Mission, White Sands Missile Range, N. Mex.
NIKE-HERCULES. SIMULATED TRANSPORTATION ENVIRONMENTAL TESTING OF NIKE-HERCULES AFT-BODY WARHEAD CONTAINER,
by Fred M. Edginton. June 61, 26p. incl. illus. tables (Technical memo. no. 880)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Tests, Guided missile noses, *Containers, Impact shock, Vibration, *Guided missile warheads, Transportation, Handling.

Drop, pendulum impact, and vibration tests were conducted at two temperatures, +165 F and -65 F, on a standard Nike-Hercules Aft-Body Container with its intended contents, an aft-body section and a nose cone section, enclosed. Minor damage to the container's wooden skids occurred during drop and pendulum impact tests. Vibration testing caused the toggle mechanism within the inertia switch to malfunction. With this one exception, the container is apparently capable of furnishing the protection for which it was designed. (Author)

AD-260 141 Div. 12, 6, 9
(26 July 61) OTS price $4.60

Aerospace Corp., El Segundo, Calif.
VARIATION OF SATELLITE POSITION WITH UNCERTAINTIES IN THE MEAN ATMOSPHERIC DENSITY,
by H. K. Karrenberg, E. Levin, and D. H. Lewis. 12 June 61, 40p. incl. illus. (Rept. no. TDR-594(1150)TN-7)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Orbital flight paths, Tracking, *Position finding, *Atmosphere, *Density, Earth, Rotation, *Drag, Errors, Integration, Mathematical analysis.

For satellites whose orbits are totally or partially immersed in the atmosphere, a variation in predicted position occurs due to the uncertainty in the mean atmospheric density at any given altitude. The effects of this uncertainty on altitude, in-track position, and cross-track position are considered. Analytic relations between the in-plane position and mean atmospheric

density, and number of revolutions since the last precision orbit determination are found. This analysis is valid for near-circular orbits of any inclination about a spherical Earth. An uncertainty in predicted period occurs due to the uncertainty in mean atmospheric density. This period uncertainty, coupled with the rotation of the Earth, gives rise to a lateral (cross-track) displacement of the locus of subsatellite points (compared to the locus for an orbit with nominal period). The effects of this displacement on the azimuths and rise times required for satellite acquisition are considered. Only circular polar orbits about a spherical rotating Earth were considered. Favorable agreement was found between analytic predictions and machine-integrated orbits. (Author)

AD-260 178 Div. 12, 9
(26 July 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
VELOCITY REQUIREMENTS FOR ABORT FROM THE BOOST TRAJECTORY OF A MANNED LUNAR MISSION,
by Robert E. Slye. July 61, 41p. incl. illus.
(Technical note no. D-1038)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-1038.

DESCRIPTORS: *Lunar probes, Manned, *Bailout, *Propulsion, Velocity, Booster rockets, Atmosphere entry, Orbital flight paths, Safety devices, Deceleration, *Aviation accidents, Hazards, *Spaceships, Control systems.

An investigation is made of the abort velocity requirements associated with failure of a propulsion system for a manned lunar mission. Two cases are considered: abort at less than satellite speed, which results in maximum decelerations in the following entry, and abort at greater than satellite speed with immediate return to earth. The velocity requirements associated with the latter problem are found to be substantial (several thousand feet per second) and are found to be even more severe if boost trajectories which lead to burnout at high altitudes or large flight-path angles are used. The velocity requirements associated with abort at less than satellite speed are found to be less severe than those for abort at greater than satellite speed except for non-lifting vehicles. It is found that abort rockets sufficient for abort at greater than satellite speed can be used to reduce maximum decelerations in entries following an abort at lower speeds. This reduction is accomplished by use of the abort rockets to decrease entry angle immediately prior to entry into the atmosphere. (Author)

AD-260 196 Div. 12
(26 July 61) OTS price $11.00

Space Technology Labs., Inc., Los Angeles, Calif.
ADVANCED GUIDANCE STUDIES. VOLUME IV. APPENDICES.
31 May 61, 148p. incl. illus. 16 refs. (Rept. no. 7216-0003-RU-V04)
(Contract AF 04(647)619)
(AFBMD TR 61-59, vol. 4) Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Guidance, *Radio navigation, *Doppler navigation, Doppler systems, Radio receivers, Sensitivity, Crystal oscillators, Data transmission systems, *Interferometers, Errors, Atmospheric refraction, Radio waves, Propagation, Data processing systems, Guided missile trajectories, Mathematical analysis, Transformations (Mathematics).

Contents:
Fundamental sensitivity limitations for second-order phase-lock loops
Fundamental accuracy limitations in a two-way coherent doppler
Transformation of interferometer errors to spherical polar coordinates
Lower atmospheric refraction correction for an interferometer
Propagation corrections for interferometric measurements
Reduction of VSO flight test data

AD-260 324 Div. 12, 2, 30
(31 July 61) OTS price $.75

Lockheed Aircraft Corp., Sunnyvale, Calif.
DEVELOPMENT OF A COMPUTER SUBROUTINE FOR PLANETARY AND LUNAR POSITIONS.
Technical rept. on Celestial Mechanics,
by Herman F. Michielsen and Martin A. Krop.
May 61, 26p. incl. tables.
(Contract AF 33(616)6638, Proj. 7041)
(ARL-46, Suppl. to WADD TR 60-118, AD-247 127)
Unclassified report

DESCRIPTORS: *Programming, Moon, Planets, *Digital computers, *Space flight, Astrophysics, Preparation, Astronomical data, *Celestial mechanics.

An attempt is made to reduce the time required in computing planetary and lunar positions data, and to improve the program where possible. An option was evolved which allows the omission of the determination of the Moon's velocity (if not required) at a considerable savings in computer time. (Author)

AD-260 542 Div. 12, 27
(2 Aug 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
PREDICTED PERFORMANCE OF ON-OFF SYSTEMS FOR PRECISE SATELLITE ATTITUDE CONTROL,
by Stuart C. Brown. July 61, 64p. incl. illus.
(Technical note no. D-1040)
Unclassified report

Also available from NASA Wash. 25, D. C., as NASA technical note D-1040.

DESCRIPTORS: *Satellities, Guidance, Control, Simulation, Computers, *Jet engines, Attitudes, *Stability, *Control systems.

An investigation has been made of the use of on-off reaction jets for precision attitude control of a satellite. Since a symmetrical vehicle is assumed, only single-axis control needs to be considered. The responses to initial disturbances and also limit-cycle characteristics for several systems have been evaluated. Calculated results indicate that realistic values of settling time and fuel consumption for the example considered can be obtained. The performance of a given system depends on the characteristics of the error detector used. In cases where the detector output was saturated

for a relatively low error input, the settling time deteriorated when a lead network was used to provide damping. This deterioration could be eliminated if a separate rate signal to produce vehicle rate limiting were available. As an alternate approach, two systems were investigated which used a timed sequence of torques and could operate with a detector output of very small linear range. (Author)

AD-260 637 Div. 12, 9
(4 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
DECLINATION, RADIAL DISTANCE, AND PHASES OF THE MOON FOR THE YEARS 1961 TO 1971 FOR USE IN TRAJECTORY CONSIDERATIONS,
by Donald S. Woolston. Aug 61, 48p. incl. illus. tables (Technical note no. D-911)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-911.

DESCRIPTORS: *Moon, Diurnal variations, *Periodical variations, Phase studies, *Lunar probes, Flight paths, *Launching, Orbital flight paths.

As a byproduct of the preparation of solar and lunar coordinates for use in trajectory calculations, a time history obtained of the radial distance and declination of the moon and its phases. Results are intended for use as an aid in the selection of launch dates. Results are presented for the years 1961 to 1971 in a form which permits a rapid approximate determination of the combination of declination and lighting for any calendar date. The information provides a time basis for entering tables of the moon's coordinates to obtain more precise data for use in computing insertion conditions. (Author)

AD-260 758 Div. 12
(7 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THEORY AND DESIGN CURVES FOR A YO-YO DE-SPIN MECHANISM FOR SATELLITES,
by J. V. Fedor. Aug 61, 11p. incl. illus. (NASA TN-D-708)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA technical note D-708.

DESCRIPTORS: *Satellite vehicles, Spin, Reduction, Mathematical analysis, Design, Differential equations, Dynamics.

The yo-yo de-spin mechanism is essentially two pieces of wire with weights on the ends. These wires are symmetrically wrapped around the equator of the satellite and the weights are secured by a release mechanism. At a preselected time after satellite spin-up and separation from the launching vehicle, the weights are released, thus discarding enough momentum to reduce the spin of the satellite to the desired value. Equations are developed for the yo-yo de-spin mechanism. Under conditions usually met in a de-spin application, the equations can be greatly simplified. A computation sheet is presented based on the simplified equations. The design of a de-spin mechanism is thus reduced to reference to a chart and a few simple calculations. (Author)

AD-260 766 Div. 12, 25
(8 Aug 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
RETICLE RUNOUT IN SIDEWINDER-TYPE SEEKERS, WITH SPECIFIC REFERENCE TO THE SIDEWINDER 1C MISSLE MK 29 MODS,
by R. E. Lawrence. 11 July 61, 16p. incl. illus. (NOTS TP 2718)
(NAVWEPS Rept. 7751)
Unclassified report

DESCRIPTORS: *Guided missiles, Air to air, *Infrared target seekers, Reticles, Guidance, Lenses, Infrared optical systems, Gyroscopes, Spin, Rotating structures, Errors, Optical systems.

Reticle runout is defined as the condition where the reticle of a Sidewinder-type seeker, as projected into object space, does not rotate about the center of its pattern. The sources of runout are considered for a simple lens-reticle system and then specifically considered for the Mk 29 Sidewinder 1C missile optical system. It is shown that reticle runout can be eliminated in all imperfectly centered systems by appropriate rebalancing of the supporting gyroscope. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-260 384 Div. 13
(31 July 61) OTS price $1.10

Naval Ordnance Test Station, China Lake, Calif.
NOMOGRAPHS FOR THRUST AT PIPE BENDS AND SIZE OF CONCRETE ANCHOR BLOCKS,
by Harry P. Schmidt and William G. Burke.
May 61, 6p. incl. illus. (NOTS TP 2646)
Unclassified report

DESCRIPTORS: Civil engineering, Nomographs, *Pipe bends, Thrust, *Foundations (Structures), Design, Hydrostatic pressure, Concrete.

The report presents a set of nomographs for civil engineers (hydraulics option) intended to minimize lengthy calculations involving radial thrust at pipe bends and the size of the supporting concrete anchor blocks. (Author)

AD-260 385 Div. 13, 31
(31 July 61) OTS price $.75

Naval Research Lab., Washington, D. C.
A PORTABLE THERMISTOR-BRIDGE GAS LEAK DETECTOR,
by A. Hafner. 3 July 61, 18p. incl. illus. (NRL rept. no. 5647)
Unclassified report

DESCRIPTORS: *Gas leaks, Detection, *Detectors, Mobile, Sensitivity, Gases, *Thermal conductivity, Reliability, *Submarines, Safety devices, Design, *Thermistors, Measurement, Gas flow, Refrigerants, Refrigeration systems, Air conditioning equipment, Shipborne.

A new portable gas leak detector useful for locating leaks in pressurized systems containing any gas having a thermal conductivity different from

that of air is described. The detector is accoupled and hence does not respond to the gas concentration in the ambient air but only to the change in concentration encountered in the vicinity of a leak. Investigations and experiments led to a choice of a thermistor bridge in which optimum response time and minimum sensitivity to gas flow rate variations is obtained by using thermistors shielded from the turbulence of the direct gas flow by glass envelopes but with a hole in each envelope to admit the gas by diffusion. Care was taken in the circuit design to prevent blocking of the high-gain amplifier by noise. Sensitivity of the gas leak detector was checked against a calibrated leak of Freon-12, and the device proved to be useful in locating Freon F-12 leaks of as small as 2 ounces per year. It was used with marked success during submarine operation. (Author)

AD-260 604 Div. 13
(3 Aug 61) OTS price $7.60

Engineer Corps, Washington, D. C.
DESIGN OF UNDERGROUND INSTALLATIONS IN ROCK. TUNNELS AND LININGS.
Engineering and Design Manual.
1 Jan 61, 63p. incl. illus. tables, 29 refs.
(Rept. no. EM 1110-345-432)
Unclassified report

DESCRIPTORS: Instruction manuals, *Underground structures, Rock, Earth moving equipment, Construction, *Shelters, Design, Mathematical analysis, Stresses.

Contents:
Assumptions used in tunnel design
Homogeneous and isotropic formations
Openings in horizontal bedded formations
Inclined bedded formations
Tunnel linings to resist explosions
Conventional tunnel supports
Underground dynamic loading
Design considerations and criteria

AD-260 605 Div. 13
(3 Aug 61) OTS price $5.60

Engineer Corps, Washington, D. C.
DESIGN OF UNDERGROUND INSTALLATIONS IN ROCK. SPACE LAYOUTS AND EXCAVATION METHODS.
Engineering and Design Manual.
1 Apr 61, 53p. incl. illus. tables, 40 refs.
(Rept. no. EM 1110-345-433)
Unclassified report

DESCRIPTORS: Instruction manuals, *Underground structures, Rock, Earth moving equipment, Construction, *Shelters, Design, Costs, Configuration.

Contents:
Configuration of openings
Primary entrances
Secondary openings
Space layouts
Excavation costs
Fundamentals of rock excavation
Horizontal Tunnel in intact rock
Methods and equipment for excavating high chambers
Methods and equipment for sinking vertically
Methods and equipment for shaft raising
Methods and equipment for sinking inclines

14. MATERIALS (NON-METALLIC)

AD-260 031 Div. 14, 12
(24 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF OXIDATION-RESISTANT COATINGS ON GRAPHITE AND MOLYBDENUM IN TWO ARC-POWERED FACILITIES,
by Roger W. Peters and Thomas A. Rasnick, July 61. 29p. incl. illus. tables (NASA Technical note D-838)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-838.

DESCRIPTORS: *Refractory coatings, Re-entry vehicles, Hypersonics, Graphite, Titanium alloys, Molybdenum alloys, Oxidation, Silicon coatings, Coatings, High temperature research, Low pressure research, Space environmental conditions, Simulation, Test facilities, Tests, Aerodynamic heating, Materials, Oxidation inhibitors.

A number of leading-edge specimens of ATJ graphite and 0.5% Ti-Mo alloy were tested in a 6-inch subsonic low-pressure arc-powered tunnel and a 1,500-kw subsonic arc jet to determine the effectiveness of several refractory coatings in preventing the oxidation of these materials. The results indicate that the siliconized coating for the ATJ graphite and the M-2 and Durak MG coatings for the Ti-Mo alloy provide adequate protection at temperatures up to 3,000 F for the durations of the tests in these facilities, approximately 70 sec in the arc tunnel and approximately 10 min in the arc jet. The stability of these coatings may be depreciated under the low-pressure environmental conditions encountered during reentry. (Author)

AD-260 065 Div. 14
(25 July 61) OTS price $3.00

Southern Research Inst., Birmingham, Ala.
THE THERMAL PROPERTIES OF SOME PLASTIC PANELS.
Rept. for 1 Mar 59-31 July 60 on The Chemistry and Physics of Materials,
by Paul T. Howse, Jr., C. D. Pears, and Sabert Oglesby, Jr. Jan 61. 137p. incl. illus. tables.
(Contract AF 33(616)6073, Proj. 7360)
(WADD TR 60-657) Unclassified report

DESCRIPTORS: *Plastics, *Resins, Expanded plastics, Epoxy resins, Phenolic resins, Glass textiles, Asbestos fibers, Silicone resins, *Laminates, Heat resistant polymers, Nylon, *Reinforcing materials, Thermal conductivity, Specific heat, Thermal expansion, High temperature research, Test equipment, Fibers, Mechanical properties, Heat transfer, Materials, Measurement, Physical properties.

The thermal expansion, specific heat, and thermal conductivity were measured for one foam core and 12 different resin-reinforcement combinations. The temperature range was generally from -50 to 700 F. Rather extensive physical property data are also presented on all of the materials. The specific heats of the laminates ranged from about 0.25 to 0.47 Btu/lb F with most falling between about 0.25 and 0.32 Btu/lb F. The nylon-reinforced material had a specific heat of 0.47 Btu/lb F. Expansion coefficients varied considerably. The only materials with a reasonably constant slope through the entire temperature range contained silicone resin. An increased expansion coefficient was found with increased deviation from the major fiber axis from 0 to 90 degrees. (Author)

AD-260 071 Div. 14
(25 July 61) OTS price $5.60

Nonmetallic Materials Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
PROPERTIES OF THERMALLY DEGRADED ABLATIVE PLASTICS.
Rept. for Oct 59-Oct 60, on Non-Metallic and Composite Materials,
by Herbert S. Schwartz, Donald L. Schmidt and others. Jan 61, 51p. incl. illus. tables.
(WADD TN 60-286) Unclassified report

DESCRIPTORS: *Plastics, *Resins, Phenolic resins, Glass textiles, Asbestos fiber, *Fibers, Synthetic fibers, Nylon, Silanes, Silicon compounds, Oxides, Cotton textiles, Physical properties, Chemical properties, Mechanical properties, Charcoal, Carbon, *Pyrolysis, *Ablation, Erosion, Porous materials, Porosity, Rocket motor nozzles, Heat resistant polymers, Test methods, Graphite, Epoxy resins, High temperature research, Guided missile noses.

A comprehensive investigation was performed to determine the physical, chemical, and mechanical properties of thermally degraded plastic ablation materials. Several new experimental techniques were developed and some existing techniques were modified to obtain the desired information. Deductions from experimental results provide new information on ablation phenomena. (Author)

AD-260 123 Div. 14, 4
(24 July 61) OTS price $6.60

National Bureau of Standards, Washington, D. C.
THERMAL DEGRADATION STUDIES OF POLYMERS AT HIGH TEMPERATURES.
Rept. for 1 Feb 60-16 Apr 61, on New Chemicals and Methods,
by S. L. Madorsky, S. Straus, and Morton E. Wacks. June 61, 56p. incl. illus. tables.
(Contract AF 33(616)58-8, Proj. 7340)
(WADC TR 59-64, pt. 3) Unclassified report

DESCRIPTORS: *Polymers, Polymerization, Copolymerization, *Pyrolysis, Styrenes, Benzenes, Vinyl radicals, Ethylenes, Fluorides, Acrylic resins, Methyl radicals, Propyl radicals, Butyl radicals, Reaction kinetics, Decomposition, High temperature research, Mass spectrometers, Mass spectroscopy, Thermosetting resins, Resins, *Plastics, Fluorocarbons.

An investigation was made of the thermal degradation of polydivinylbenzene and a series of copolymers of styrene with divinylbenzene and with trivinylbenzene in the temperature range 346 to 450 C. A study was made of the relative thermal stability of these polymers and copolymers and of the qualitative and quantitative compositions of the degradation products. Another phase consisted of a study of rates and activation energies of thermal degradation of these materials. The results indicate a gradual increase of thermal stability of the copolymers as the amount of the crosslinking agents, divinylbenzene or trivinylbenzene, is increased. An investigation was made of thermal degradation of polystyrene, polymethylene, polytetrafluororethylene, polyalpha-methylstyrene, polypropylene, polyisobutylene, and poly(methyl methacrylate). Tests and specifications on the newly acquired Bendix Corporation time-of-flight mass spectrometer are discussed. (Author)

AD-260 185 Div. 14, 4, 25
(26 July 61) OTS price $1.60

Plastics Lab., Princeton U., N. J.
HIGH POLYMER RESEARCH.
Quarterly status rept. no. 61, 1 Feb-1 June 61, by L. F. Rahm. 1 June 61, 13p. (Contract rept. no. 10)
(Contract DA 36-039-sc-78105, Proj. 3-99-15-108) Unclassified report

DESCRIPTORS: *Polymers, *Ferrocenes, *Plastics, *Dielectrics, *Semiconductors, Polycyclic compounds, Molecular structure, Butadienes, Ethylenes, Polymerization, Allyl radicals, Bromides, Ammonium radicals, Silanes, Electrical conductance, Elasticity, Mechanical properties, Viscosity, Transport properties, Manufacturing methods, Melting, Metalorganic compounds, Chemical bonds.

CHEMICAL SECTION: Polymerization of nonconjugated double bond systems; Directional hydrogen bonding-property relationships in polyamides; and ferrocene chemistry. DIELECTRICS SECTION: Semiconduction in high polymers; and Melt behavior of sheared high polymers. MECHANICAL SECTION: Dynamic mechanical properties of polyolefins; Polymer melt elasticity; and Low temperature properties of polypropylene. (Author)

AD-260 194 Div. 14, 25
(26 July 61) OTS price $1.60

Systems Research Labs., Inc., Dayton, Ohio.
THE ELECTRICAL BEHAVIOR OF REFRACTORY OXIDES.
Bimonthly progress rept. no. 3,
by Robert W. Vest, 12 July 61, 19p. incl. illus.
(Rept. no. 203-3)
(Contract AF 33(616)7748)
Unclassified report

DESCRIPTORS: *Refractory materials, *Zirconium compounds, Dioxides, *Oxides, Crystals, Single crystals, *Metallic crystals, Electrical conductance, Electrical properties, Thermoelectricity, Polarization, Phase transitions, High temperature research, Temperature, Preparation, Growth, Mathematical analysis.

Polycrystalline disc shaped samples for conductivity and polarization measurements were made of ZrO2. The discs were coated with Pt paste and fired, yielding Pt electrodes measuring less than 1 ohm across each face. Conductivity measurements were made from 200 to 1360 C; the monoclinic-tetragonal phase transformation caused a hysteresis loop in the conductivity curve. The inversion occurred near 1170 C on heating and 1030 C on cooling. Conductivity was greater at the same temperature in the tetragonal modification. The activation energy for conduction of ZrO2 in the tetragonal modification was 1.05 e.v., lower than the 1.5 e.v. in the monoclinic phase at the same temperature. Polarization data yielded a transport number of 0.2 for electrons in monoclinic ZrO2 at 907 C. Attempts to grow single crystal ZrO2 are discussed. Several small platelets (too small for x-ray diffraction analysis) were presumed to be ZrO2 through indirect tests.

AD-260 209 Div. 14
(2 Aug 61) OTS price $7.60

Bendix Products Div. Bendix Corp., South Bend, Ind.
THERMAL PROTECTIVE SURFACES FOR STRUCTURAL PLASTICS.
Rept. for Jan-Sep 60 on Non-Metallic and Composite Materials,
by James W. Vogan. Mar 61, 68p. incl. illus. tables.
(Contract AF 33(616)6393, Proj. 7340)
(WADD TR 60-110, pt. 2) Unclassified report

DESCRIPTORS: *Insulating materials, *Thermal insulation, Plastics, Reinforcing materials, Coatings, *Refractory coatings, Binders, Metal coatings, Ceramic materials, Glass textiles, Zirconium compounds, Nickel, Styrenes, Polymers, *Rocket motor nozzles, Test methods, Erosion, Surfaces, High temperature research, Dioxides, Materials.

New insulating composite systems were fabricated for solid fuel rocket engine. The basic structure consisted of an outer refractory surface of multilayer construction and a porous inorganic thermal barrier. These were adhesively bonded to the substrate plastics. Multilayer Ni-zirconia coatings applied by flame and plasma spray techniques were used as the principal erosion resistant surfaces. Composite structures were investigated in test firings of a solid fuel rocket. These firings showed that the composite structures of plastic and a thermal barrier offered improved behavior in tests up to 20 seconds. Various materials were tested as possible mechanical reinforcements for the insulating layer. Metal honeycombs were selected for use in the fabrication studies. (Author)

AD-260 252 Div. 14
(21 Aug 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
THERMAL DEGRADATION OF PHENOLIC POLYMERS,
by Hugh C. Anderson. 23 Jan 61, 5p. illus. tables.
(NAVWEPS rept. no. 7379) Unclassified report

DESCRIPTORS: *Phenolic resins, *Heat resistant polymers, *Pyrolysis, Resins, Polymers, Copolymerization, Polymerization, Chlorides, Silanes, Nylon, Furaldehydes, Phenols, Molecular structure, Decomposition, Gravimetric analysis, Plastics, Glass textiles, Formaldehyde, Carbonization.

A study has been made of the thermal decomposition of 15 phenolic polymers, using vacuum thermogravimetry as a tool. These polymers included regular phenolics, chlorinated phenolics, and phenolics copolymerized with silane, nylon and phenol-furfural resins. The results are discussed in relationship to the chemistry of phenolic polymers. A high crosslink density and the large concentration of aromatic groups in these polymers are thought to be the causes of their carbonization and slow decomposition characteristics. (Author)

AD-260 253 Div. 14, 4
(27 July 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
OXIDATION OF PYROLYTIC GRAPHITE BETWEEN 1250 F AND 1850 F.
Rept. on Research of Materials for High Temperature Use,
by Milton Levy. May 61, 15p. incl. illus. table.
(Technical rept. no. WAL TR 851.4/1)
Unclassified report

DESCRIPTORS: High temperature research, Microstructure, Materials, *Graphite, Oxidation, Chemical properties, Chemical reactions, Pyrolysis.

The oxidation of pyrolytic graphite was studied as a function of time and temperature. Pyrolytic graphite does not oxidize as rapidly as commercial graphite at temperatures below 1450 F but approaches that of commercial graphite at 1550 F. Oxidation of pyrolytic graphite proceeds preferentially in the c-direction contrary to expectation. The break in the Arrhenium plot for pyrolytic graphite occurring at 1550 F may be attributed to the change in control mechanism from chemical reactivity to diffusion control. An activation energy of 37,180 calories per mol was calculated for a commercial graphite. The activation energy calculated for pyrolytic graphite was 23,350 calories per mol. The lower activation energy for pyrolytic graphite is associated with a lower reaction rate. This anomalous behavior is attributed to its lower porosity since a less porous material exposes a smaller surface area for molecular collisions. (Author)

AD-260 289 Div. 14, 6
(28 July 61) OTS price $2.60

Navy Electronics Lab., San Diego, Calif.
INVESTIGATION OF SONAR DIAPHRAGM COATINGS.
Research and development rept. for Jan 59-Dec 60,
by J. C. Thompson, R. K. Logan, and R. B. Nehrich. 17 Mar 61, 23p. incl. illus. tables.
(NEL rept. no. 1026)
Unclassified report

DESCRIPTORS: Sonar, Sonar domes, *Sonar equipment, Diaphragms (Mechanics), *Coatings, *Plastic coatings, Metal coatings, Rubber coatings, Ceramic coatings, Sea water, Weatherproofing, Corrosion, Elasticity, Mechanical properties, Adhesion, Plating, *Underwater sound equipment, Steel, Urethanes, Polymers, Test methods, Tests.

Investigations were made of commercial coating materials for sonar equipment, particularly sonar diaphragms constructed of 5% Cr steel, Vasco-Jet 1000. Properties sought included elasticity to withstand vibration of the sonar diaphragm, resistance to the natural environment (sea water and salt atmosphere), air drying, and adhesiveness. Of the 19 coatings tested, a polyurethane product, Laminar X-500, passed the tests and possessed the required qualities. When properly applied this material is exceptionally effective in the protection of underwater equipment.

AD-260 373 Div. 14, 8
(31 July 61) OTS price $5.60

ITT Federal Labs., Nutley, N. J.
DEVELOPMENT OF MANUFACTURING PROCESSES FOR HIGH PURITY ELECTRONIC CERAMICS.
Interim rept. 6 Feb-6 July 61 on Phase 1,
by J. H. Battle, E. W. Currier, and others.
July 61, 57p. incl. illus. tables.
(Contract AF 33(600)42473, Proj. 7-772)
(ASD TR 7-772, vol. 2) Unclassified report

DESCRIPTORS: *Ferroelectric materials, *Piezoelectric materials, *Ceramic materials, Manufacturing methods, Production, Barium compounds, Titanates, Niobates, Tantalum compounds, Zirconates, Chemical reactions, Chemical analysis, Hydrolysis, Spectrographic analysis, Dielectric properties, Colorimetric analysis, Gravimetric analysis, Electronic equipment.

An investigation was begun to develop new or improved manufacturing methods for large scale production of ferroelectric and piezoelectric

ceramic materials such as titanates, zirconates, niobates, and tantalates with a purity of 99.95%. Progress is reported on the pre-pilot plant scale-up, standardization of the reaction, and the design of a pilot plant capable of producing a nominal 25-lb lot per 8 hr. The direct chemical precipitation of $BaTiO_3$ from high pH barium hydroxide and tetraisopropyl titanate has been carried out under pre-pilot plant conditions. One pound reproducible batches have been made. Chemical analysis shows that the purity level is within the required limits. Bodies have been prepared from these powders and electrical measurements made to check the reproducibility. (Author)

AD-260 397 Div. 14, 4
(1 Aug 61) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
ULTRA-VIOLET CURING POLYESTER SYSTEMS.
Final research and development rept.,
by J. Kaminetsky. 16 Sep 60, 18p. incl. tables.
(Lab. proj. no. 6111)
Unclassified report

DESCRIPTORS: *Resins, *Plastics, *Laminates, *Esters, Polymers, *Glass textiles, Aging, Processing, Ultraviolet radiation, Catalysts, Gels, Photochemical reactions, Polymerization, Physical properties, Mechanical properties, Radiation damage.

Glass reinforced-polyester resin laminates were fabricated by means of artificial ultra-violet radiation at 0 C, and 25 C, and in direct sunlight. Benzoin, benzil and Garalyst sensitizers were used. The laminates produced had physical properties that compared favorably with those fabricated with conventional peroxidic systems. With U V curing systems, it was possible to obtain long pot-life and short gel periods, two requirements for laying up complex plastic structures. Physical properties and fabrication details are listed in accompanying tables. (Author)

AD-260 422 Div. 14, 30
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
IMPROVEMENT OF THERMOMECHANICAL TESTING OF POLYMERS THROUGH AUTOMATIC RECORDING.
22 June 61, 5p. (AID rept. no. 61-96)
Unclassified report

DESCRIPTORS: *Heat resistant polymers, Polymers, *Plastics, *Deformation, Temperature, Pressure, Mechanical properties, Heating, Tests, Test equipment, Test methods, Automation, USSR, Analysis.

The method of thermomechanical curves, used extensively in the USSR for determining mechanical properties of polymers at varying temperatures, is discussed. A fully automatic laboratory device has been constructed for recording the values of monoaxial compression of a polymer at gradually increased temperatures, while the polymer changes state from the glassy (or vitreous) to the highly elastic, and finally to the viscous-plastic. The points on the generally S-shaped thermomechanical curve representing these changes of state are the glass-transition point Tg and flow point Tf. In the new device monoaxial compression is produced by the pressure of an interchangeable load on the specimens while they are being subjected to temperature variations in the -120 to 400 C range. The dimensional changes are converted into electric signals and recorded continuously. (Author)

AD-260 479 Div. 14, 25
(31 July 61) OTS price $1.60

Textile Research Inst., Princeton, N. J.
MOLECULAR CONFORMATION IN ORIENTED FIBERS.
by A. V. Tobolsky and V. D. Gupta. July 61, 11p. (Technical rept. no. 23)
(Contract nos. Nonr-09000 and Nonr-09001)
Unclassified report

DESCRIPTORS: *Fibers, *Polymers, *Molecular structure, Theory, Mathematical analysis, Crystal structure, Textiles, Lattices.

A theoretical analysis was made of the molecular chains in an oriented fiber. The chains were considered to trace out a path on a cubic crystal lattice. The chain passes through amorphous regions in which the link vectors of the chain successively point in the 3-dimensional coordinate directions. The chain also passes through crystalline regions in which succesive link vectors all point in the + x direction or the -x direction. This model corresponds to a fiber whose crystallites are completely oriented in the x direction.

AD-260 484 Div. 14, 30
(1 Aug 61) OTS price $1.00

Nonmetallic Materials Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A BENCH SCALE METHOD FOR DETERMINING PERFORMANCE CHARACTERISTICS OF LUBRICANTS IN AN OXIDATIVE ENVIRONMENT AT HIGH TEMPERATURES.
Rept. Jan-July 60 on Aviation Lubricants,
by Samuel B. Schexnailder. Dec 60, 31p. incl. illus.
(Proj. 3044)
(WADD TR 60-794) Unclassified report

DESCRIPTORS: *Lubricants, *Airplane engine oils, *Hydraulic fluids, Additives, Lubrication, Lubricant additives, Jet engines, Test equipment, Test methods, Oxidation, Viscosity, High temperature research, Temperature, Physical properties, Chemical properties, Turbojet engines, Determination, *Oils.

An effective bench scale method for determining physical and chemical characteristics of lubricants subjected to high temperatures in oxidizing environments is described herein. The apparatus employed is sufficiently simple and economical for even the smallest research facility. However, the methods developed and described herein are applicable for large scale programs. Data obtained from its use can be readily interpreted to indicate probable performance of experimental fluids and lubricants under the specific conditions used in the screening program. (Author)

AD-260 524 Div. 14, 1
(2 Aug 61) OTS price $3.60

Applied Science Research Lab., U. of Cincinnati, Ohio.
TESTING OF RAIN EROSION RESISTANCE OF AIRCRAFT COATINGS.
Final rept.,
by George E. Thompson, Jr. 1 Feb 61, 35p. incl. tables.
(Contract NOa(s) 60-6065-c)
Unclassified report

DESCRIPTORS: *Aircraft finishes, Raindrops, Erosion, Exposure, *Coatings, *Ceramic coatings, Plastic coatings, Effectiveness, Tests, Epoxy resins, Synthetic rubber, Glass textiles, Urethanes, Polymers, Aluminum, Aluminum compounds, Oxides.

Contents:
High-gloss ceramic
High-porosity ceramic
Alumina ceramic
White neoprene and white polyurethane
MIL-L19537, AML Urithon and epoxy coatings on alumina
Black epoxy on fibreglass

AD-260 536 Div. 14, 26
(2 Aug 61) OTS price $5.60

General Electric Co., Cincinnati, Ohio.
THE EFFECT OF ARC PLASMA DEPOSITION ON THE STABILITY OF NON-METALLIC MATERIALS.
Final rept. May 60-May 61,
by B. E. Kramer, M. A. Levinstein, and J. W. Grenier. May 61, 57p. incl. illus. tables.
(Contract NOa(s) 60-6076-c)
Unclassified report

DESCRIPTORS: *Refractory coatings, *Ceramic coatings, *Refractory materials, *Ceramic materials, *Graphite, Coatings, Oxides, Borides, Carbides, Nitrides, Aluminum compounds, Cerium compounds, Chromium compounds, Hafnium compounds, Niobium compounds, Tantalum compounds, Titanium compounds, Zirconium compounds, *Flame spraying, Stability, Physical properties, Thermal conductivity, Resistance, Hardness, Thermal expansion, Density, *Plasma jet, Erosion, Crystal structure, High temperature research.

The oxides of Al, Cr, Zr, Ce, Hf and mixtures of Zr and Nb; the carbides of Hf, Ta and Zr; the nitrides of Ti and Ta; and the boride of Zr were sprayed on a graphite substrate without chemical or microstructure alteration; the operating conditions for the deposition of these materials were determined. The resistance of the deposited coatings to a 5000 F, high velocity, air blast was determined as well as the static oxidation behavior. Al2O3, Cr2O3 and ZrB2 can be deposited readily in thick, dense serviceable deposits. These materials conferred resistance to a graphite substrate in the blast test, ZrB2 through the smooth conversion to a dense adherent ZrO2 coating. The carbide and nitride deposits did not withstand the oxidation erosion test. CeO2 and HfO2 were not satisfactorily deposited; ZrO2 as laid down from the oxide powder yields a highly stressed deposit. (Author)

AD-260 561 Div. 14, 12
(3 Aug 61) OTS price $1.60

Bjorksten Research Labs., Inc., Madison.
HIGH VISCOSITY REFRACTORY FIBERS.
Quarterly rept. no. 6, 1 Feb-30 Apr 61,
by Stanley A. Dunn and William P. Roth.
30 Apr 61, 11p.
(Contract NOrd-19100)
Unclassified report

DESCRIPTORS: *Ceramic fibers, Ceramic materials, *Refractory materials, *Reinforcing materials, Insulating materials, Thermal insulation, *Glass textiles, Glass, Copper, Test methods, Powder metals, Viscosity, Diffusion, Vacuum furnaces, Mixtures, Fibers, Measurement, Test equipment, Manufacturing methods, Guided missiles, Silicon compounds, Dioxides.

A low-power vacuum furnace for high temperature fiber elongation viscosity determinations was constructed. For work of a preliminary nature and at lower temperatures, a complete but simplified fiber elongation apparatus composed of standard laboratory components was assembled. A method for producing more uniform dispersions of copper in silica was developed. (Author)

AD-260 575 Div. 14, 29
(3 Aug 61) OTS price $2.60

Harris Research Labs., Washington, D. C.
INFLUENCE OF BLENDING ON PROPERTIES OF WOOL-TYPE FABRICS.
Quarterly rept. no. 4 (Final) for period ending 11 Dec 59,
by Lyman Fourt. Apr 61, 22p. incl. illus. tables, 27 refs.
(Contract DA 19-129-qm-1336, Proj. 7-93-18-020A)
(Textile series rept. no. 116)
Unclassified report

DESCRIPTORS: Textiles, *Clothing, *Woolen textiles, Chemical properties, Mechanical properties, *Synthetic fibers, Military personnel, Physiology, Moisture.

Wool-type fabrics have special combinations of features arising from the chemical properties of wool (high water adsorbing capacity and low flammability) and also special mechanical properties of elasticity and long-range stretch that are in part chemical, based on their polymeric structure. The distinctive structural feature of wool in fabric form is a randomness of arrangement of the individual fibers. This randomness is found particularly in woolens, where extensive fiber rearrangement is produced in fulling, but it is also found in worsteds, which have the most regular arrangement of fibers of any wool fabric. However, blending wool with other fibers, especially in worsted fabrics, usually reduces the randomness of fiber arrangement. This may be desirable for summer clothing but it is not desirable for cold weather use. In woolens, wool-type characteristics can be more completely retained by design to promote fulling. With respect to the relation of clothing to the physiology of heat balance, the relatively greater thickness and lower density of wool-type structures tend to conserve heat and reduce wicking and the accumulation of moisture. However, the high regain of wool tends to increase the accumulation of moisture and to spread the time required for changes due to moisture passage. (Author)

AD-260 581 Div. 14, 1
(2 Aug 61) OTS price $2.60

Snell, Foster D., Inc., New York.
RAIN REPELLENT.
Quarterly interim rept. no. 2, 1 Apr-30 June 61,

by R. Blaufox, E. McDonnell, and J. Mitchell Fain. 10 July 61, 29p. incl. tables. (Contracts NOw 61-0463-c, NOa(s) 60-6029-c, and NOa(s) 59-6046-c)

Unclassified report

DESCRIPTORS: *Moistureproofing, *Films, *Silicones, *Silanes, *Coatings, *Silicon coatings, Sulfuric acid, Boric acids, Oils, Plastic coatings, Windshields, Aircraft, Jet engine fuels, Raindrops, Stability, Organic solvents, Storage, Propanol, Packaging, Epoxy resins, Thin films, Boron compounds, Temperature.

A formulation based on acidified dimethyldiethoxysilane dissolved in n-hexyl ether and combined with silicone oil has good rain repellent properties and an increased flash point. Its proper utilization in an aerosol package requires further investigation. A formulation based on acidified dimethyldiethoxysilane is stable to temperatures of -10 and 160 F. It withstands temperatures of -65 and 500 F after application. Its films are resistant to isopropyl alcohol. (Author)

AD-260 665 Div. 14
(3 Aug 61) OTS price $2.60

Institute of Research, Lehigh U., Bethlehem, Pa.
BASIC FACTORS IN THE FORMATION AND STABILITY OF NON-SOAP LUBRICATING GREASES FOR USE AT ELEVATED TEMPERATURES.
Quarterly progress rept. no. 4, 1 Apr-1 July 61, by John J. Chessick, Albert C. Zettlemoyer and others. 1 July 61, 17p. incl. tables. (Contract AF 33(616)7120)

Unclassified report

DESCRIPTORS: *Greases, *Lubricant additives, *Lubricants, Additives, High temperature research, *Carbon black, Ions, Surface properties, Inorganic substances, Silicon compounds, Dioxides, Oxygen, Water, Adsorption, Stability, Preparation, Silanes.

The study of carbon blacks for use as thickeners in non-soap greases indicates that blacks with areas greater than 100 sqm/g and low volatile content possess the most desirable properties. Sufficient ion-incorporated silicas have now been prepared and subjected to stability tests in non-soap grease systems to definitely establish the enhancement of properties of the treated solids relative to the untreated silica. Such treated solids show great promise for use at elevated temperatures. A limited study was made of the surface properties of ion-incorporated samples by adsorption techniques. Preparation of high area MoS_2 is also reported. (Author)

15. MATHEMATICS

AD-260 095 Div. 15
(25 July 61) OTS price $1.10

Institute for the Study of Human Variation, Columbia U., New York.
A NOTE ON THE EXACT VARIANCE OF PRODUCTS, by Leo A. Goodman. 27 April 61, 4p. (Rept. no. CU-52-61-Nonr-266(33)MS)
(Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

DESCRIPTORS: *Analysis of variance, *Statistical analysis, Statistical processes, Mathematical prediction, Series.

AD-260 203 Div. 15
(26 July 61) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
LINEAR OPERATORS WITH POSITIVE INVERSE, by J. Schroder. May 61, 43p. 18 refs. (MRC technical summary rept. no. 230)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Operators (Mathematics), Functional analysis, Differential equations, Matrix algebra, Functions, Vector analysis.

The theorem considers an operator M on a partially ordered space into such a space. The question at issue is determination of those conditions under which the equation, Mu is less than or equal to Mv, implies the equation, u is less than or equal to v. An operator with this property is called the monotonic type (L. Collatz. Aufgaben monotoner Art. Arch. Math. 3:365-376, 1952). For linear operators the conditions for a monotonic operator have two equivalent forms: (1) the equation, Mu is greater than or equal to zero, implies the equation, u is greater than or equal to zero; and (2) M has a positive inverse. It is shown that nonlinear operators can be proved to be of monotonic type if certain linear operators have this property.

AD-260 204 Div. 15
(26 July 61) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
SINGULAR PERTURBATIONS OF A BOUNDARY VALUE PROBLEM FOR A NON-LINEAR SYSTEM OF DIFFERENTIAL EQUATIONS, by W. A. Harris, Jr. May 61, 30p. (MRC technical summary rept. no. 229)
(Contract DA-11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Differential equations, Perturbation theory, *Nonlinear differential equations, Integral equations, Series, Matrix algebra, Functions.

AD-260 256 Div. 15, 22
(28 July 61) OTS price $19.75

Army Research Office, Durham, N. C.
TRANSACTIONS OF THE SIXTH CONFERENCE OF ARSENAL MATHEMATICIANS HELD AT THE U.S. ARMY RESEARCH OFFICE (DURHAM) 1-2 JUNE 1960.
Mar 61, 330p. incl. illus. (Rept. no. ARODR 61-1)
Unclassified report

DESCRIPTORS: Exterior ballistics, Satellite vehicles, Guided missiles, Satellite vehicle trajectories, Celestial mechanics, Orbital flight paths, Inertial guidance, Logistics, *Symposia, *Applied mathematics, Numerical analysis, Non-linear differential equations, Differential equations, Partial differential equations, Perturbation theory, Games theory, *Ordnance, Armored vehicles, Tanks, Casting, Stability, Thermal stresses, Gun barrels, Heat transfer, Reliability, Mathematical logic, Nonlinear systems, Programming, Acceleration, Digital computers, Velocity, Deformation, Bodies of revolution, Elastic shells, Stresses, Cylindrical bodies, Elasticity.

Contents: Some Historical Comments on Spinning Missiles; Nutation Damper - A Simple Two-Body Gyroscopic System; Effect of a Strongly Nonlinear Static Moment on the Pitching and Yawing Motion of a Symmetric Missile; Asymptotic Estimates of the Deviation of Boosted Spinner Rockets During the Burning Period; The Geometry of the Orbits of Artificial Satellites; Problems of Cost Evaluation from War Game Analysis; Combat Vehicle Firing Stability; Transient Thermal Stresses in Gun Tubes; The Concept of Reliability - A Mathematical analysis; A More General Method for Nonlinear Programming; Determination of Velocity and Acceleration Data from Positions; On the Solidification of a Cylindrical Centrifugal Casting; Small Deflections of a Shallow Paraboloidal Shell Under Its Own Weight; On the Basic Theory of Thin Cylindrical Shells and On Existence, Uniqueness, and Numerical Evaluation of Solutions of Ordinary and Hyperbolic Differential Equations.

AD-260 325 Div. 15
(31 July 61) OTS price $5.60

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE USE OF SAMPLE RANGES AND QUASI-RANGES IN SETTING EXACT CONFIDENCE BOUNDS FOR THE POPULATION STANDARD DEVIATION. I. THE RANGE OF SAMPLES FROM A RECTANGULAR POPULATION -- PROBABILITY INTEGRAL AND PERCENTAGE POINTS; EXACT CONFIDENCE BOUNDS FOR SIGMA.
Rept. on Mathematical Techniques of Aeromechanics, by H. Leon Harter. May 61, 56p. incl. tables. (Rept. no. ARL-31, pt. 1)
(Proj. no. 7071)
Unclassified report

DESCRIPTORS: *Statistical analysis, Statistical distributions, Probability, Tables, *Statistical tests, Errors.

A discussion is given of point estimates and interval estimates of the population standard deviation sigma, based on the sample range and quasi-ranges. In the case of a rectangular population, the efficient point estimate and the most effective interval estimates are those based on the sample range, so it is not necessary to consider estimates based on sample quasi-ranges. The coefficients of the sample range w in the exact confidence bounds for the population standard deviation sigma are found by taking the reciprocals of percentage points of the standardized range W = w/V sigma. The following tables for the rectangular population are included: (1) An eight-decimal-place table of the probability integral of the range for W = 0.01(0.01)3.46 (0.001)3.464 and sample sizes n = 2(1)20(2)40(10) 100; (2) a six-decimal-place table of the percentage points of the range corresponding to cumulative probabilities P = 0.0001, 0.0005, 0.001, 0.005, 0.01, 0.025, 0.05, 0.1 (0.1) 0.9,

0.95, 0.975, 0.99, 0.995, 0.999, 0.9995, 0.9999 for the same values of n; and (3) a table of the coefficients of the sample range w in the exact lower confidence bounds for sigma for the above values of P and n. (Author)

AD-260 329 Div. 15, 25, 2
(31 July 61) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUMERICAL SOLUTIONS OF THE UNDERGROUND SUBSIDENCE PROBLEM,
by Tadeusz Leser and Andrzej Jenike. Apr 61, 30p. incl. illus. table (BRL rept. no. 1131)
(Proj. no. 503-06-002; In cooperation with Utah U., Salt Lake City)
Unclassified report

DESCRIPTORS: *Underground structures, Soil, Motion, Partial differential equations, *Fluid flow, Plasticity, *Plastic flow, Compressible flow, *Numerical analysis, Fluid mechanics.

The subsidence problem can be formulated as follows: suppose there is an underground cavity of height episilon at some depth below the surface. At the time t = 0 the soil begins to subside filling out the cavity and the subsidence continues to move vertically up toward the surface of the earth. It is also assumed that the subsidence occurs along a vertical shaft of a unit cross-section making it a one-dimensional phenomenon. We assume further that the crumbled earth is a continuum whose motion can be simulated by that of a compressible fluid and that the subsidence occurs continuously. The boundary value problem controlling the above described model consists of the partial differential equation of continuity (conservation of mass), of the equation of conservation of momentum, and of the conditions on the fixed boundary when t = 0 and on the boundary moving with the wave front. Here the equation of the conservation of momentum has been replaced by an assumed relation, based on experience, which takes care of the elasto-plastic properties of the soil. The solution gives the displacement of the wave front as a function of the time, showing that in most cases the subsidence reaches only a certain height and then it stops. (Author)

AD-260 337 Div. 15, 30
(31 July 61) OTS price $1.60

Numerical Analysis Research, U. of Calif., Los Angeles.
SIMULATION AS EXPERIMENTAL MATHEMATICS,
by James R. Jackson. 22 June 61, 10p. (Management sciences research proj. research rept. no. 72)
(Contract Nonr-23302, Proj. NR 047-003)
Unclassified report

DESCRIPTORS: Simulation, Mathematics, *Mathematical analysis, Probability, Digital computers, *Operations research, Scheduling.

Computational experimentation is described using simulators as means for realizing abstractly defined mathematical models. The experimental work is closely integrated with related mathematical analysis. The concept of simulator experimentation is presented as a technique supplementary to mathematical analysis. (Author)

AD-260 338 Div. 15
(31 July 61) OTS price $1.60

Numerical Analysis Research, U. of Calif., Los Angeles.
WAITING TIME DISTRIBUTIONS FOR QUEUES WITH DYNAMIC PRIORITIES,
by James R. Jackson. 28 June 61, 10p.
(Management sciences research proj. research rept. no. 73)
(Contract Nonr-23302, Proj. NR 047-003)
Unclassified report

DESCRIPTORS: *Probability, Scheduling.

AD-260 451 Div. 15
(2 Aug 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON POMPEIU'S PROOF OF THE MEAN VALUE THEOREM OF THE DIFFERENTIAL CALCULUS OF REAL VALUED FUNCTIONS,
by A. K. Aziz and J. B. Diaz. June 61, 27p.
(Technical note no. BN-251)
(Contract AF 49(638)228; In cooperation with Georgetown U.)
(AFOSR-1081)
Unclassified report

DESCRIPTORS: *Differential equations, *Partial differential equations, *Functional analysis, Theory, *Calculus of variations, Functions.

In a recent paper (Trans. Am. Math. Soc. 96: 90-100, 1960; Ann. Matematica, ser. 4, 52: 163-181, 1960) the writers obtained a mean value theorem for vector valued functions of a real variable which plays a role analogous to that of Lagrange's mean value theorem in the differential calculus of real valued functions. This report contains an analysis of various methods for proving these theorems. (Author)

AD-260 462 Div. 15, 28, 23
(2 Aug 61) OTS price $.75

Behavioral Sciences Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
LINEAR PROGRAMMING AND WORKPLACE ARRANGEMENT: SOLUTION OF ASSIGNMENT PROBLEMS BY THE PRODUCT TECHNIQUE.
Rept. on Psychological Research on Human Performance,
by Walter J. Huebner Jr. and Bernard C. Ryack. Mar 61. 21p. incl. illus. tables, 4 refs.
(Proj. no. 7183)
(WADD TR 61-143)
Unclassified report

DESCRIPTORS: *Linear programming, *Human engineering, Mathematical predictions, Functional analysis, Production, Job analysis, Matrix algebra, Effectiveness.

The applicability of linear programming to assignment problems which arise in connection with work space arrangement is demonstrated. To solve problems of this nature, a method termed the product technique was developed. Compared with other linear programming techniques, the product technique has simplicity and direct relevance to problems in the human factors area. Several modifications of the technique are discussed. (Author)

AD-260 552 Div. 15, 8, 30
(2 Aug 61) OTS price $7.60

Parke Mathematical Labs., Inc., Carlisle, Mass.
ANNOTATED BIBLIOGRAPHY ON THE MINIMIZATION OF BOOLEAN FORMULAS AND SWITCHING CIRCUITS.
Dec 60, 76p. 227 refs. (Scientific rept. no. 5)
(Contract AF 19(604)3471)
(AFCRL-45) Unclassified report

DESCRIPTORS: *Bibliography, *Switching circuits, *Mathematical logic, *Algebras.

More than two hundred titles are presented of papers and several books which deal with the problems encountered in the minimization of Boolean formulas and switching networks, or with mathematical results that have been directly useful in the study of such problems. Although fairly complete, this list does not pretend to be exhaustive. Whenever possible without undue amount of labor, a short abstract of the paper is given: often, this abstract is (or is summarized) from the one given by the author or by a reviewer. The main sources are our own experience, the Mathematical Review, the I.R.E. periodicals and the bibliographies given at the end of the papers we could consult. (Author)

AD-260 560 Div. 15
(3 Aug 61) OTS price $8.10

Rand Corp., Santa Monica, Calif.
A VARIATIONAL APPROACH TO DIFFERENTIAL GAMES,
by L. D. Berkovitz. 30 June 61, 85p. incl. illus. (Research memo. no RM-2772)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Games theory, Differential equations, Calculus of variations, Functional analysis, Functions.

A class of differential games having pure strategy solutions is investigated by means of results and techniques from the calculus of variations. These games are related to two Bolza problems with differential inequalities as added side constraints. Necessary conditions that must hold along an optimal path are derived from the theory of the related Bolza problems. These conditions are (1) a multiplier rule, together with transversality conditions and jump conditions, (2) a local min-max condition that is related to the Weierstrass condition, and (3) an analogue of the Clebsch condition. The continuity and differentiability properties of the value of the game are derived. It is shown that, wherever the value is differentiable, it satisfies an analogue of the Hamilton-Jacobi equation. Sufficient conditions are given in terms of the notion of a field and of a local min-max condition. (Author)

AD-260 568 Div. 15
(3 Aug 61) OTS price $1.60

Johns Hopkins U., Baltimore, Md.
PRINCIPAL FIBRATIONS,
by Jean-Pierre Mayer. 1960, 12p.
(Contract DA 36-034-ORD-3299)
(AROD-2799:1) Unclassified report

DESCRIPTORS: *Algebraic topology, Groups (Mathematics).

A fibration with an Eilenberg-MacLane space of type (pi,n), n greater than 1, as fiber and simply-connected base is equivalent to one induced from a path-space fibration by a map of the base into an Eilenberg-MacLane space of type (pi, n + 1). For the purposes of this paper, and by analogy with the classification theory of fiber-bundles, this is called a fabrication principal. The problem considered the conditions under which a fibration with a loop-space as fiber is equivalent to a principal one. (Author)

AD-260 573 Div. 15
(3 Aug 61) OTS price $6.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
EXTENDED STABILITY CRITERIA FOR DIFFERENTIAL EQUATIONS VIA LIAPOUNOV THEORY.
Rept. for Sep 60-June 61 (Master's thesis), by William N. Redisch. 16 May 61, 55p. incl. illus. (Research rept. no. PIBMRI-913-61)
(Contract DA 30-069-ORD-2646, Proj. 2268)
(AROD rept. no. 2268:7) Unclassified report

DESCRIPTORS: *Differential equations, Special functions, Functions, Stability.

A judicious choice of an appropriate quadratic Liapounov function lends itself to graphical interpretation from which one gains insight into Liapounov's theory, rather than getting tangled in the mathematical abstracts. This graphical approach leads to much valuable information about the behavior of the solution to a linear homogeneous differential equation with time-varying coefficients. Without having to solve the differential equation, it is possible to draw conclusions about the stability of the solution. Principles are readily established for a first-order equation via a two-dimensional plane, and may generally be extended to second-order equations via a three-dimensional space. (Author)

AD-260 598 Div. 15
(3 Aug 61) OTS price $9.10

Washington U., Seattle.
METHODS OF APPROACH AT THE UNIVERSITY OF WASHINGTON TO THE PROBLEM OF ANALYTIC ROTATION TO A SIMPLE STRUCTURE MATRIX,
by Charlotte MacEwan. July 61, 102p. incl. tables.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: *Factor analysis, Least squares method, Transformations (Mathematics), Matrix algebra.

The problem of analytic rotation in factor analysis is attacked from various points of view in the methodological research carried on at the University of Washington. Twenty-eight mathematical rationales and/or computational procedures are developed, and empirical tests of twenty-three of these are made, often with multiple sets of data, in an attempt to determine their effectiveness. Some fifty-odd problems are computed in this effort. (Author)

AD-260 606 Div. 15
(3 Aug 61) OTS price $1.10

Operations Research Center, U. of Calif., Berkeley.
A FILING PROBLEM,

Division 15 - MATHEMATICS

by William S. Jewell. 3 Mar 61, 5p. (Research rept. no. 1; Rept. no. IER 172-1)
(Contract Nonr-22283)

Unclassified report

DESCRIPTORS: *Probability, *Distribution theory, Binomials, Functions, Mathematical analysis, Probability, Data storage systems, Statistical distributions, Linear programming.

AD-260 608 Div. 15
(3 Aug 61) OTS price $1.10

Operations Research Center, U. of Calif., Berkeley.
RESTRICTED ARRIVAL PROBABILITIES APPLIED TO A CONSTANT SERVICE TIME QUEUEING MODEL,
by Edward Dierauf. 17 Apr 61, 7p. incl. illus. table (Research rept. no. 3; Rept. no. IER 172-4)
(Contract Nonr-22283)

Unclassified report

DESCRIPTORS: *Probability, Difference equations, Distribution theory.

A periodically-serviced constant service single channel queue is studied. The arrival distribution is general in nature except for the restriction that not more than three units can arrive during any one service interval. The maximum permissible queue length can be either finite or infinite. Equations describing the steady-state probabilities are third order linear difference equations. The solutions of the state probabilities are found in terms of the roots of the characteristic equation. (Author)

AD-260 609 Div. 15
(3 Aug 61) OTS price $2.60

Operations Research Center, U. of Calif., Berkeley.
A LINEAR RISK MODEL,
by William S. Jewell. 28 Apr 61, 18p. incl. illus. (Research rept. no. 4; Rept. no. IER 172-5)
(Contract Nonr-22283)

Unclassified report

DESCRIPTORS: Operations research, Linear systems, *Probability, *Linear programming, Distribution theory.

A special structure optimization model is presented which includes many of the single variable risk problems that are encountered in operational problems. A risk function is assumed which is a piece-wise linear function of some random variable whose distribution is known; one seeks the value of the decision variable which minimizes expected risk. In this paper are presented the necessary and sufficient conditions for this optimization for random variables which are either continuously or discretely distributed. The important special case of a continuous risk function is discussed; multiple risk problems with a joint constraint are analyzed; and the change in policy for a small change in the distribution of the random variable is investigated. Examples illustrate the application of the model. (Author)

AD-260 610 Div. 15
(3 Aug 61) OTS price $1.10

Operations Research Center, U. of Calif., Berkeley.
SUPPORTS OF A CONVEX FUNCTION,
by E. Eisenberg. 22 May 61, 7p. (Research rept. no. 5; Rept. no. IER 172-6)
(Contract Nonr-22283)

Unclassified report

DESCRIPTORS: *Convex sets, Functions, Polynomials, Sequences.

AD-260 672 Div. 15
(4 Aug 61) OTS price $8.60

Naval School of Aviation Medicine, Pensacola, Fla.
MOLAR CORRELATIONAL ANALYSIS,
by Marshall B. Jones. 1 July 60, 101p. incl. illus. tables (Monograph series no. 4)

Unclassified report

DESCRIPTORS: Factor analysis, Correlation techniques, Matrix algebra, *Mathematical logic, *Statistical analysis.

A methodology for solving problems by a process of correlational deductive logice is described. The essence of the method involves four main steps, (1) calculating the correlation matrix, (2) looking for a correlation pattern, (3) hypothesizing a factor structure to explain it, and (4) comparing the theoretical and empirical results. The second step of this process, going from a correlation pattern to a factor structure, is never mechanical. It always involves a psychological leap which, though it may be suggested by the correlation pattern, is never required by it. In fact, there are many occasions in which the hypothesizing of the factor structure precedes even the calculating of the correlations. A very considerable part of the book is devoted to the different types of structure and the correlation patterns which they generate. (Author)

AD-260 704 Div. 15
(7 Aug 61) OTS price $2.60

Institute of Statistics, U. of North Carolina, Chapel Hill.
INFERENCE ON TREATMENT EFFECTS AND DESIGN OF EXPERIMENTS IN RELATION TO SUCH INFERENCE,
by S. N. Roy and J. N. Shrivastava. Jan 61, 26p. (Mimeograph series no. 274)
(Contract AF 49(638)213)
(AFOSR-136)

Unclassified report

DESCRIPTORS: *Statistical analysis, Statistical tests, Analysis of variance, Operations research, *Scheduling, Tests, Design.

Inference procedures and designs are discussed that are more appropriate to those situations in ANOVA or MANOVA where, against the customary or standard null hypothesis, we are interested in certain non-standard alternatives or, in other words, we are interested in increasing the discrimination along certain (non-standard) directions of deviation, even at some cost to the discrimination along other directions of deviation. It is indicated how, for several such situations, it is possible to improve upon both the customary designs and the customary inference procedure. (Author)

AD-260 708 Div. 15, 30
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
A CODING PROBLEM ARISING IN THE TRANSMISSION OF NUMERICAL DATA,
by R. C. Bose and I. M. Chakravarti. Apr 61, 15p. incl. illus. (Mimeograph series no. 284)
(Contract AF 49(638)213; In cooperation with Case Institute of Technology)
(AFOSR-898) Unclassified report

DESCRIPTORS: *Coding, *Data transmission systems, Sequences, Information theory, Numbers.

A biunique coding from the set of the 2 to the nth power integers 1, 2,..., 2 the nth power onto the set of the 2 the nth power n-place binary sequences is shown. It has some minimal properties. (Author)

AD-260 709 Div. 15, 30
(7 Aug 61) OTS price $3.60

Institute of Statistics, North Carolina U., Chapel Hill.
ON THE DEFINITION OF A CERTAIN CLASS OF AUTOMATA,
by M. P. Schutzenberger. Jan 61, 33p. (Mimeograph series no. 273)
(Contract AF 49(638)213)
(AFOSR-87) Unclassified report

DESCRIPTORS: *Metamathematics, Control systems, *Digital computers, Algebra, Polynomials, *Cybernetics.

This note verifies that a large part of Kleene's Theory of regular events still applies to a class of automata with an infinite set of states. (Author)

AD-260 710 Div. 15
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
ON THE EQUATION $a^{2+n}=b^{2+m}c^{2+p}$ IN A FREE GROUP,
by M. P. Schutzenberger. June 61, 15p. (Mimeograph series no. 290)
(Contract AF 49(638)213)
(AFOSR-912) Unclassified report

DESCRIPTORS: *Groups (Mathematics), Algebra, Equations.

AD-260 711 Div. 15
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
ON A SPECIAL CLASS OF RECURRENT EVENTS,
by M. P. Schutzenberger. June 61, 15p. (Mimeograph series no. 291)
(Contract AF 49(638)213)
(AFOSR-891) Unclassified report

DESCRIPTORS: *Probability, Measure theory, Groups (Mathematics).

AD-260 712 Div. 15
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
SOME TERNARY ERROR CORRECTING CODES AND FRACTIONALLY REPLICATED DESIGNS,
by R. C. Bose. May 61, 14p. (Mimeograph series no. 295)
(Contract AF 49(638)213)
(AFOSR-1090) Unclassified report

DESCRIPTORS: *Combinatorial analysis, Coding, Errors, Information theory, Projective geometry, Matrix algebra.

The connection between the theory of error correcting codes and the theory of fractionally replicated designs is pointed out. It is shown that the packing problem plays a fundamental role in both theories. This is the problem of finding the maximum possible number of distinct points in the finite projective space PG(r-1, p), where p is a prime or a prime power, so that no d of the points are dependent. Here we find a configuration of 12 points in PG(5, 3) so that no 6 are dependent. Ternary error correcting codes and some fractional factorial designs (with or without blocking) are deduced. (Author)

AD-260 713 Div. 15
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
SOME PROPERTIES OF THE LEAST SQUARES ESTIMATOR IN REGRESSION ANALYSIS WHEN THE INDEPENDENT VARIABLES ARE STOCHASTIC,
by P. K. Bhattacharya. June 61, 15p. (Mimeograph series no. 292)
(Contract AF 49(638)213)
(AFOSR-892) Unclassified report

DESCRIPTORS: *Statistical analysis, Statistical functions, Matrix algebra, Least squares method, Distribution theory, *Sampling.

For the linear regression of y on x observations the loss in estimating the true regression function by another function is considered as a loss function. For the loss function, it is shown under certain conditions that if the class of estimates which are linear in y's and have bounded risk is non-empty, then the estimate obtained by the method of least squares belongs to this class and has uniformly minimum risk in this class. A necessary and sufficient condition on the distribution function of x observations is obtained for this class to be non-empty, which unfortunately is not easy to verify in particular cases and is violated in a very simple situation. However, by a sequential modification of the sampling scheme, this condition may always be satisfied at the cost of an arbitrarily small increase in the expected sample size. It is also shown under certain further conditiops on the family of admissible distributions that the least squares estimator is minimax in the class of all estimators. (Author)

AD-260 714 Div. 15, 30
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
A REMARK ON FINITE TRANSDUCERS

Division 15 - MATHEMATICS

by M. P. Schutzenberger. June 61, 15p. (Mimeograph series no. 289)
(Contract AF 49(638)213)
(AFOSR-893) Unclassified report

DESCRIPTORS: *Groups (Mathematics), Transducers, Automation, Statistical analysis, Algebra, *Computers.

A very restricted class of transducers, i.e. of automata which transform finite input words into finite output words is considered. The simplest case is the transformation consisting in the replacement of every input letter x by an output word $\eta(x)$ which is eventually the empty word e sub Y. (Author)

AD-260 715 Div. 15
(7 Aug 61) OTS price $1.60

Institute of Statistics, North Carolina U., Chapel Hill.
APPLICATION OF THE GEOMETRY OF QUADRICS FOR CONSTRUCTING PBIB DESIGNS,
by D. K. Ray-Chaudhuri. June 61, 18p. (Mimeograph series no. 294)
(Contract AF 49(638)213)
(AFOSR-897) Unclassified report

DESCRIPTORS: *Projective geometry, Transformations (Mathematics), Series, Algebra, Matrix algebra, *Combinatorial analysis.

A number of families of partially balanced incomplete block designs (PBIB) with two associate classes is constructed using the properties of quadrics in finite projective geometry. (Author)

AD-260 716 Div. 15
(7 Aug 61) OTS price $16.50

Institute of Statistics, North Carolina U., Chapel Hill.
INVESTIGATIONS ON FACTORIAL DESIGNS,
by R. C. Bose and M. S. Patel. Apr 61, 218p. incl. illus. tables, 36 refs. (Mimeograph series no. 285)
(Contract AF 49(638)213)
(AFOSR-895) Unclassified report

DESCRIPTORS: Factor analysis, *Mathematics, *Combinatorial analysis, Statistical analysis, Matrix algebra.

Fractionally replicated designs are obtained for 2 to the mth power, 3 to the nth power, and experiments with their product with the number of treatment-combinations just sufficient to estimate the main effects, the two-factor interactions and the error, without requiring difficult computation. With some additional treatment combinations, designs are also obtained so as to balance the estimates in the sense of the variances. Some of the designs so obtained are arranged into blocks. The analysis, both for the univariate case and the multivariate case is given. (Author)

AD-260 717 Div. 15
(7 Aug 61) OTS price $8.60

Institute of Statistics, North Carolina U., Chapel Hill.
A MINIMUM AVERAGE RISK SOLUTION FOR THE PROBLEM OF CHOOSING THE LARGEST MEAN,
by Richard Park Bland. Apr 61, 93p. incl. illus. tables, 27 refs. (Mimeograph series no. 280)
(Contract AF 49(638)929)
(AFOSR-933) Unclassified report

DESCRIPTORS: *Statistical analysis, *Sampling, Statistical tests, Statistical functions, Integration, Analysis of variance.

The problem of choosing the largest of n means is considered as a multiple decision problem which is generated from n component two-decision problems. With additive losses Bayes rules for the component problems yield Bayes rules for the multiple decision problem. Some properties of these Bayes rules are found. Also a conservative-near-Bayes rule is presented with tabled values for any number of means. (Author)

AD-260 729 Div. 15
(8 Aug 61) OTS price $1.60

Operations Research Center, U. of Calif., Berkeley.
DUALITY IN HOMOGENEOUS PROGRAMMING,
by E. Eisenberg. 26 June 61, 11p. (Research rept. no. 8; IER 172-9)
(Contract Nonr-22283; In cooperation with Brown U. Contract Nonr-56215)
Unclassified report

DESCRIPTORS: *Linear programming, Functions, *Convex sets, Inequalities, Matrix algebra.

The problem of maximizing a concave function subject to linear constraints does not have a dual, as is the case in linear programming, in which primal optimizing variables do not appear. As a special case of the principal result it follows that such a dual does indeed exist whenever the objective function is also homogeneous. (Author)

AD-260 730 Div. 15
(8 Aug 61) OTS price $5.60

Case Inst. of Tech., Cleveland, Ohio.
EXACT POWER OF SOME TESTS BASED ON MOOD'S AND MASSEY'S STATISTICS,
by I. M. Chakravarti, F. C. Leone, and J. D. Alanen. Apr 61, 59p. incl. tables.
(Contract AF 49(638)361)
(AFOSR-1049) Unclassified report

DESCRIPTORS: *Statistical tests, Sampling, Statistical distributions, Tables.

The objects of this investigation are: (1) To derive the exact power functions of Mood's (Introduction to the Theory of Statistics, New York, McGraw-Hill, 1951) and Massey's (Ann. Math. Stat. 22:304-306, 1951) tests for two samples against parametric alternatives of exponential and rectangular populations, (2) to tabulate them for comparable sample sizes in order to get an idea about their respective performances and also to evaluate if there is any resultant gain in the use of Massey's test (which uses more than one fractile and hence is more elaborate) over Mood's tests. (Author)

AD-260 732 Div. 15, 26
(8 Aug 61) OTS price $2.60

Operations Research Center, U. of Calif., Berkeley.
WAITING FOR A GAP IN TRAFFIC,
by William S. Jewell. 15 June 61, 23p. incl.

illus. 14 refs. (Research rept. no. 6; Rept. no. IER 172-7)
(Contract Nonr-22283)
Unclassified report

Presented at the Second Western Joint Meeing of the Operations Research Society of America and Institute of Management Science, Monterey, California, April 15-16, 1960.

DESCRIPTORS: *Scheduling, *Probability, Operations research, Distribution theory, *Traffic, Control.

The waiting-time is considered of a driver on a secondary road who wishes to enter or cross a primary traffic stream, given that he will do so only when the spacing to the next vehicle is at least as great as some fixed critical gap. The initial waiting-time distribution and its first two moments are obtained under the assumption of arbitrary starting-up and headway distributions of the primary traffic stream. Under the assumption that only one car may enter the intersection per gap, the distribution of successive waiting times (the inter-gap distribution) and its moments are obtained. The counting distribution of the passing of gaps is then used to describe the numbers of cars which leave the secondary road during a fixed interval of time. Various asymptotic and limiting results are demonstrated, together with the special results obtained when the traffic is Poisson. The necessary modifications for other gap criteria are also indicated. (Author)

AD-260 735 Div. 15, 26
(8 Aug 61) OTS price $8.60

Institute for the Study of Human Variation, Columbia U., New York.
PROBABILISTIC INVESTIGATION OF A SINGLE SERVER QUEUEING PROCESS WITH POISSONIAN INPUT AND BATCH SERVICE,
by Lakshmi Venkataraman. June 61, 91p. (Rept. no. CU-56-61)
(Contract nos. Nonr-26633 and Nonr-26655)
Unclassified report

DESCRIPTORS: *Scheduling, *Probability, Statistical distributions, Integral tranforms, Operations research.

A probabilistic investigation is made of a single server queueing process with Poissonian input and batch service. The interarrival times are assumed to be independent and identically distributed random variables. The first come-first served policy is used to study the waiting time distribution. (Author)

AD-260 751 Div. 15
(8 Aug 61) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
DIOPHANTINE SETS OVER POLYNOMIAL RINGS,
by Martin Davis and Hilary Putnam. June 61, 12p. (Rept. no. IMM-NYU-283)
(Contract AF 49(638)777)
(AFOSR-821)
Unclassified report

DESCRIPTORS: *Metamathematics, Polynomials, Algebra.

It is proved that every recursively enumerable set is Diophantine over a given polynomial ring. (Author)

AD-260 753 Div. 15
(8 Aug 61) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
EXTENSIONS AND COROLLARIES OF RECENT WORK ON HILBERT'S TENTH PROBLEM,
by Martin Davis. June 61, 12p. (Rept. no. IMM-NYU-282)
(Contract AF 49(638)777)
(AFOSR-820)
Unclassified report

DESCRIPTORS: *Metamathematics, Functions, Polynomials.

The theorem that every recursively enumerable set is exponential Diophantine is improved; a sharp form is given of Kleene's (Introduction to Metamathematics, D. Van Nostrand Company, Inc., 1952) normal form theorem, a problem of Quine (Synthese, VII; 441-46, 1948-9) is proved recursively unsolvable. (Author)

AD-260 793 Div. 15
(8 Aug 61) OTS price $1.10

Washington U., Seattle.
ON A STRUCTURE F SATISFYING F TO THE 3rd POWER EQUALS O,
by Kentaro Yano. 20 June 61, 6p. (Technical rept. no. 12)
(Contract Nonr-47715, Proj. NR 043 186)
Unclassified report

DESCRIPTORS: *Tensor analysis, Operators (Mathematics), Matrix algebra.

16. MEDICAL SCIENCES

AD-260 046 Div. 16
(24 July 61) OTS price $1.10

Pennsylvania U. Graduate School of Medicine, Philadelphia.
CONTINUATION OF STUDIES OF CHROMOPROTEIN METABOLISM WITH SPECIAL REFERENCE TO (A) THE METABOLISM OF CYTOCHROME c IN TISSUES AND (B) THE ROLE OF THE SPLEEN IN DEGRADATION OF HEMOGLOBIN.
Final rept.
by David L. Drabkin. June 61, 10p., 26 refs.
(Contract Nonr-55116)
Unclassified report

DESCRIPTORS: *Metabolism, Tissues (Biology), *Hemoglobin, Spleen, Chromatographic analysis, Proteins, *Blood proteins, Mathematical analysis, Absorption, *Cytochromes, Cytochrome oxidase, Carbon monoxide poisoning, Biochemical tests, Electrophoresis, Measurement.

AD-260 122 Div. 16
(25 July 61) OTS price $1.10

University of Southern Calif., Los Angeles.
A STUDY OF MARINE BIOLOGY OF THE NORTH POLAR

BASIN.
Annual rept. 1 July 60-30 June 61,
by J. L. Mohr. 30 June 61, 5p.
(Contract Nonr-22819, Proj. NR 107-567)
Unclassified report

DESCRIPTORS: *Marine biology, *Arctic regions, *Ecology, Temperature, Pressure, Animals, Plants, Sedimentation, *Marine meteorology, Soils.

AD-260 212 Div. 16
(27 July 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
NUTRITION AND ENERGY EXPENDITURE AT LITTLE AMERICA V IN THE ANTARCTIC,
by Frederick Milan and Kaare Rodahl. Mar 61, 17p. incl. illus. tables, 14 refs. (AAL TR 60-11)
(In cooperation with Lankenau Hospital Research Inst., Philadelphia, Pa.)
Unclassified report

DESCRIPTORS: *Nutrition, *Metabolic products, Diet, Antarctic regions, *Exposure, Body weight, Man, Physiology, Experimental data, Time, Motor reactions, Reaction (Psychology).

A detailed survey of nutrition and energy expenditure was undertaken to establish the effects of chronic cold exposure and changing levels of activity upon the nutritional requirements of men living at an antarctic base. This survey represented 104 subject days (6-day periods) in the antarctic fall, winter, and spring. In the fall, five scientists averaged a daily expenditure of 3775 Calories and consumed 3400 Calories. In the winter and spring, expenditures for four scientists averaged 3370 and 4175 Calories and intakes were 4396 and 4285 Calories. Four sailors, engaged in moderate to heavy work outside, expended about 3600 Calories per day and consumed 4925 Calories when studied in the spring. The percentage of calories furnished by protein, fat, and carbohydrate was not different from those to be found in the diet of U. S. troops eating a garrison ration elsewhere. There was no increased avidity for fat over the year. The scientists gained an average of 1.5 kilograms in body weight, and the sailors an average of 4.6 kilograms over the 11-month period. It is suggested that eating served to alleviate the tedium of long isolation and that psychological, as well as physiological, reasons lay behind the high caloric intakes seen in some subjects. (Author)

AD-260 213 Div. 16
(27 July 61) OTS price $2.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THERMAL STRESS IN THE ANTARCTIC,
by Frederick A. Milan. Mar 61, 19p. incl. illus. tables, 18 refs. (AAL TR 60-10)
Unclassified report

DESCRIPTORS: Antarctic regions, *Thermal stresses, *Exposure, Man, Protective clothing, Temperature, Body surface, Metabolism, Body temperature, Motor reactions, Metabolic products, Physiology, *Stress (Physiology).

Five experiments which investigated thermal balance in two clothed men in the cold were carried out at Little America V in the winter months of June and August. Environmental temperatures ranged between -32 and -47 C, and wind velocities ranged between 2 and 17 miles per hour during the experiments. Despite the protective clothing worn and the heat productions of between 3 and 4.8 mets (measured by indirect calorimetry), total heat debt (obtained by measurements of rectal and skin temperatures) ranged between 105 and 126 kilocalories for exposures of 40 to 165 minutes in duration. Finger temperatures ranged between 7 and 18 C at the end of the experiments. The thermal demand of the environment on these seemingly adequately clothed men was high, and it is suggested that they were moderately cold stressed despite high rectal temperatures. (Author)

AD-260 231 Div. 16
(25 July 61) OTS price $9.60

Lever Brothers Co., Edgewater, N. J.
BASIC STUDIES IN PERCUTANEOUS ABSORPTION.
Semi-annual rept. Jan-June 61,
by Leonard J. Vinson, Bohdan R. Choman and others. June 61, 128p. incl. illus. tables, 33 refs.
(Contract DA 18-108-cml-6573)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq. and Regional Office only.

DESCRIPTORS: *Skin, *Absorption, Biochemical tests, Metabolism, Enzymes, Penetration, Diet, Vitamins, Laboratory animals, Immunology, Test methods, Cytochemistry, Histological sections, Processing, Vitamin B, Vitamin A, Chemicals, Stress (Physiology), Radio activation analysis, Serum, Organic compounds, Inorganic substances, Water.

A broad basic study on skin was initiated to (1) determine the fundamental nature of the skin barrier, (2) elucidate the structure and mechanisms responsible for the selective resistance of skin to penetration by topical agents, and (3) select topical agents or conditions leading to skin alterations that enhance or depress percutaneous absorption. Dramatic changes in the epidermis were noted in skin of rats deficient in linoleic acid. Keratinization process is impaired; both the lucidum and corneum layers are infiltrated with fragments of nuclear material and even intact nuclei. The water diffusion rate is almost 10 times that of normal skin, and lactic acid penetrate such skin; the latter cannot penetrate normal skin. The skin barrier presumed to be in the lacidum layer is defective in animals that are deficient in linoleic acid.

AD-260 243 Div. 16
(27 July 61) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
A SELECTED REVIEW OF THE LITERATURE ON VISUAL RESPONSE TIME,
by Shelton MacLeod and Irving Alderman. June 61, 16p. incl. illus., 42 refs. (Rept. no. RADC TR 61-71)
(Proj. 8501)
Unclassified report

DESCRIPTORS: *Visual perception, Stimulation, *Reaction time, Behavior, Reaction (Psychology), Measurement, Light adaptation, Retina, *Visual thresholds, Dark adaptation, Electric potential, Optic nerve, Visibility, Nerves, Eye.

This report contains a review of the basic literature dealing with response time to single visual stimuli. Two similar types of measurement, simple reaction time and electrophysiological latency, have been included. These are discussed in the light of relationships to the following stimulus factors: luminance, exposure time, area, adaptation level and retinal locus. The nature of these relationships suggests that visual response time data offer a promising alternative to other psychophysical or psychophysiological measures. (Author)

AD-260 287 Div. 16, 6, 25
(28 July 61) OTS price $2.60

Navy Electronics Lab., San Diego, Calif.
EFFECTS OF MARINE BIOLOGICAL ENVIRONMENT ON COMPLIANT GRATING ACOUSTIC LENSES.
Research rept. for 29 July-26 Aug 59,
by E. G. Barham. 6 Mar 61. 24p. incl. illus. 26 refs. (NEL rept. no. 1018)
Unclassified report

DESCRIPTORS: *Marine biology, Ecology, *Acoustics, *Sonar equipment, *Fouling, *Lenses, Laboratory animals, Growth, Lens antennas, Sound, *Underwater objects, Underwater sound equipment, Test equipment.

Self-Contained Underwater Breathing Apparatus (SCUBA) observations were conducted on a large, experimental sound device placed in 40 feet of water in San Diego Bay for one month. A succession of fouling populations settled on the equipment, and an attraction to the device by crabs and fish was evidenced. The possible effects of such biota on instrument function are treated on the basis of work published concerning the effects of fouling and other organisms on transducer performance and underwater sound. The existing literature was surveyed to indicate the nature, intensity, and normal seasonal sequence of fouling expected in the coastal waters of the San Diego area. Possible preventive measures are described and discussed. (Author)

AD-260 291 Div. 16, 28
(28 July 61) OTS price $1.60

Navy Electronics Lab., San Diego, Calif.
THE NEL SIZE-CONTRAST TEST FOR MEASURING VISUAL PERFORMANCE.
Research and development rept. for June 59-Oct 60,
by Ailene Morris. 31 Mar 61, 12p. incl. illus.
(NEL rept. no. 1038)
Unclassified report

DESCRIPTORS: *Visual perception, *Visual acuity, *Visual thresholds, Tests, *Vision, Detection, Measurement, Test methods, Test equipment, Electronic equipment, Optical equipment, Naval research laboratories.

Research concerns the development of a simple, portable field test and procedure for the evaluation of visual capabilities, using various optical and electronic transmission devices, under various atmospheric conditions. Test results indicated the following: (1) a portable, easily administered test was developed which can be used to derive standard visual threshold curves as a function of size and contrast; (2) test scores obtained were predictable by standard visibility calculation procedures; (3) test scores varied as a function of observation range and optical magnifications; and (4) using the test's scores for the unaided eye as a basic reference, a visual efficiency index could be established for various optical and electronic image transmission devices. (Author)

AD-260 386 Div. 16, 20
(31 July 61) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE EFFECTIVENESS OF WATER-ELECTROLYTE REPLACEMENT THERAPY AND OF ANTIBIOTIC TREATMENT AGAINST ACUTE (3-5 DAY) INTESTINAL RADIATION DEATHS IN THE RAT,
by S. T. Taketa. 22 June 61, 28p. incl. illus. tables, 26 refs. (Rept. no. NRDL-TR-516)
Unclassified report

DESCRIPTORS: Water, Electrolytes (Physiology), *Therapy, *Antibiotics, *Radiation injury, Survival, Laboratory animals, *Intestine, Radiation effects, *X-rays, Dosage, *Body fluids.

The influence of water and electrolyte replacement therapy and of treatment with antibiotics against acute (3-5 day) intestinal radiation deaths in rats exposed to an acute lethal dose of X-radiation has been studied. The administration of sterile 0.9% solution containing either NaCl or a mixture of NaCl, Na lactate, and KCl during the critical 2-5 days following irradiation had little, if any, protective effect. However, treatment with antibiotics (Combiotic P-S) during the same period definitely increased the number of survivors. The degree of protection was not affected by administering the antibiotics concurrently with sterile glucose solution, whereas, it was greatly enhanced when given simultaneously with a solution containing NaCl. These results strongly suggest that both dehydration and bacteremia are casually related in the genesis of acute (3-5 day) intestinal radiation in the rat. (Author)

AD-260 387 Div. 16, 20
(31 July 61) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
RESIDUAL RADIATION INJURY EVIDENCED BY IMPAIRED REGROWTH OF REALIMENTED HYPOCALORICALLY REARED RATES,
by H. W. Carroll and R. W. Brauer. 21 June 61, 24p. incl. illus. (Rept. no. NRDL-TR-515)
Unclassified report

DESCRIPTORS: *Radiation injury, Laboratory animals, Growth, Regeneration, Diet, *X rays, Exposure, Nutrition, Dosage.

Hypocalorically reared rats were subjected to single exposures of X ray ranging from 400 to 700 rad, or to repetitive exposures of 200 rad in 4 doses spaced 1 wk apart (total 800 rad). They were allowed to recover for a minimum of 7 wk and a maximum of 6 mo following the last exposure and then returned to an adequate caloric intake. Realimentation of the irradiated populations resulted in reduced regrowth when compared to non-irradiated realimented rats of the same age. The reduction in regrowth persisted regardless of radiation exposure patterns, realimentation patterns or the recovery periods here employed. Paired-feeding demonstrated that the regrowth reduction is primarily one of reduced nutrient utilization. G.I. tract shielding showed that injury to the intestinal region with impaired absorption is probably not the cause. It is concluded that the regrowth of the irradiated realimented rats is a generalized deficiency of nutrient utilization by the organs and tissues, perhaps mediated through the endocrines. (Author)

Division 16 - MEDICAL SCIENCES

AD-260 418 Div. 16
(31 July 61) OTS price $15.00

Pennsylvania U. School of Medicine, Philadelphia.
PATHOLOGICAL PHYSIOLOGY AND THERAPY OF LUNG INJURIES.
Progress rept. 1 Oct 60-30 Sep 61,
by Domingo M. Aviado, Sep 61, 223p. incl. illus. tables, 293 refs.
(Contract DA 49-193-md-2093)
Unclassified report

DESCRIPTORS: *Pharmacology, *Pathology, Physiology, *Lungs, Therapy, *Injuries, Blood circulation, Heart, Arteries, Pressure, Blood pressure, *Vasomotor drugs, Chemicals, Stimulation, Nervous system, Anoxia, Hypotension, Neurology, Blood vessels.

The inhalation of steam in anesthetized dogs caused an increase in bronchopulmonary flow which is induced by a thermal constriction of the bronchial veins. The bronchial veins are more sensitive than the bronchopulmonary anastomoses to vasoconstrictors (norepinephrine), serotonin, as well as to vasodilators. The bronchial arterial injection of histamine elicits a reflex mediated via the vagus, consisting of bronchoconstriction, bradycardia and hypotension. The various components of the bronchial circulation, pulmonary circulation and bronchial smooth muscles have been investigated as to their sensitivity to sympathomimetic drugs, sympathetic blocking agent (bretylium) and to digitalis. Many of the drugs prove to be effective in reversing the pathological disturbances seen in thermal injury to the lungs. (Author)

AD-260 427 Div. 16, 1
(1 Aug 61) OTS price $2.60

Science and Tech. Section, Air Information Div., Washinton, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS.
Monthly rept. no. 3, Apr-May 61,
31 May 61, 22p. incl. illus. tables (AID rept. no. 61-91)
Unclassified report

DESCRIPTORS: *Space medicine, Perception, Instrumentation, Bacteria, X-rays, Space flight, *Bibliography, Man, Radiation effects, *Radiation injury, Therapy, Hypothermia, Body temperature, Auditory perception, *Space environmental conditions, Stimulation, Light, Microwaves, Neuromuscular transmission, Sound, Tissues (Biology), USSR, Radio protective drugs, Cysteine.

AD-260 441 Div. 16
(1 Aug 61) OTS price $1.10

Tufts U. School of Medicine, Boston, Mass.
EFFECTS OF COLD STRESS ON MITOCHONDRIAL OXIDATIVE PHOSPHORYLATION,
by Judith Patkin and E. J. Masoro, Apr 61,
6p. incl. tables, 10 refs.
(AAL TR 60-21) Unclassified report

DESCRIPTORS: *Cells (Biology), *Exposure, Oxidation, *Liver, *Phosphorylation, Laboratory animals, Temperature.

The P:O ratio with succinate as substrate is the same for liver mitochondria from cold-fasted rats as it is for mitochondria from control rats. Glucose-hexokinase acceptor studies using either succinate or glutamate as substrate indicate that the oxidative phosphorylating system is about as tightly coupled in the liver mitochondria from cold-fasted rats as it is in those from control rats. These results were surprising since earlier work with liver homogenates indicated that the efficiency of oxidative phosphorylation is markedly reduced in the homogenate from cold-fasted rats. The possible reasons for these differences in results with homogenates on the one hand and mitochondria on the other are discussed. The use of mitochondrial activities as an index of the efficiency of oxidative phosphorylation in vivo is also discussed. (Author)

AD-260 549 Div. 16
(2 Aug 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
ACCELERATION PROTECTION BY MEANS OF STIMULATION OF THE RETICULO-ENDOTHELIAL SYSTEM,
by E. R. Stiehm, 22 June 61, 19p. incl. illus. tables (Rept. no. NADC MA-6129)
(Task MR 005.15-0002.7, rept. no. 15)
Unclassified report

DESCRIPTORS: *Acceleration tolerance, Stimulation, Stress (Physiology), Survival, Dosage, Reticulo-endothelial system, Surgery, Bacterial toxins, Laboratory animals.

Stimulation of the rats' reticulo-endothelial system (RES) was effective in enhancing the tolerances to high G acceleration stress. Utilizing 10 daily consecutive intraperitoneal injections of endotoxin at increasing doses from 100 to 1200 micro grams, the median survival time of 122 rats undergoing 20 positive G acceleration was increased from a control level of 9.7 min to 14.2 min. One group of 48 rats has a median survival of 23.6 min compared to a control level of 11.3 min. The protective action of RES stimulation and the inhibitory action of RES blockade was effective in rats with normal or prolonged survival but not in rats with diminished tolerance before stimulatinn or blockade. An analysis of factors for optimal RES stimulation is presented as are possible mechanisms of action. (Author)

AD-260 565 Div. 16
(3 Aug 61) OTS price $1.60

Pasteur Inst. (France).
FURTHER BIOCHEMICAL AND ELECTRON-MICROSCOPE STUDIES OF VIRUS INFECTED MAMMALIAN CELLS.
Final technical rept. 1 Mar 60-28 Feb 61,
by Pierre Lepine. 22 Mar 61, 14p.
(Contract DA 91-591-EUC-1417)
Unclassified report

DESCRIPTORS: *Virus diseases, Electron microscopy, Mammals, Cells (Biology), Histology, Oxygen consumption, Biochemistry, Infections, *Viruses, Metabolism, Immunology.

A comparison was made between the cell metabolism, as judged from oxygen consumption, of normal control cells and of virus infected cells. The oxygen consumption was found in all instances to be greatly increased in cells affected with an acute virus infection. Electron microscope studies showed no direct correlation between the cell ultrastructure lesions and the metabolic variations. When chronically infected cells were reinfected with a virulent strain of the same virus or with another virus to which these cells were susceptible, the virus yield of the

acutely infecting virus was greatly decreased or negligible. In some cases a complete protection of the cell occurred when using as reinfectant a virulent strain of the same virus-type as the one responsible for the chronic infection. Biochemical extraction of the active substance yielded a substance of proteic nature the properties of which are those of interferon. This interferon was capable when introduced in a control noninfected cell-system to induce a resistance to virus infection similar to the one observed in chronically infected cells. It was not possible with interferon produced on a given cultured mammalian cell-system to transfer resistance to cells from another zoological species. Whereas the viral specificity of interferon seems to be rather slack or even inexistant, the cellular specificity is high. (Author)

AD-260 582 Div. 16
(2 Aug 61) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
STUDIES ON HABITUATION OF VESTIBULAR REFLEXES. EFFECT OF REPETITIVE CALORIC TESTS,
by Nils G. Henriksson, Robert Kohut, and Cesar Fernandez. Apr 61, 14p. incl. illus. 29 refs. (Rept. no. 61-41)
(In cooperation with Chicago U., Ill.)
Unclassified report

DESCRIPTORS: *Adjustment (Psychology), Rotation, Stimulation, Tests, *Physiology, Temperature, Motor reactions, Conditioned reflex, Eye.

The phenomenon of habituation to repetitive caloric stimulation was investigated in cats. The study included acquisition, retention, and transfer of the response decline in nystagmic reaction. Acquisition of habituation was obtained by repetitive calorization of right or left ears with hot or cold water. The rate of response decline was rapid with the initial irrigations and then tended to level off. The extent of response decline differed among animals, ranging from moderate reduction to complete extinction. In the cat, habituation could be retained after three weeks of rest; however, in several animals, recovery of normal caloric responses occurred after a few days. Transfer of habituation occurs provided the nystagmus is provoked in the same direction as that which was habituated. The evidence supports the opinion that the neural mechanism underlying habituation of vestibular reflexes is a central process. The locus of this mechanism remains unknown. Practical and theoretic implications of this phenomenon are briefly discussed. (Author)

AD-260 586 Div. 16
(2 Aug 61) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
A SIMPLE DEVICE FOR THE TRANSFER OF BIOLOGIC FLUIDS,
by John B. Fitzgerald, William G. Malette, and Ewald Koegel. May 61, 3p. incl. illus. (Rept. no. 61-62)
Unclassified report

DESCRIPTORS: *Medical equipment, Body fluids, Syringes, *Space medicine, Intravenous feeding, Weightlessness, Pumps, Design.

The transfer unit consists of a cylindric barrel with a free-floating, conical, one-way valve at either end. A Luer-Lok adapter for the attachment of a hypodermic syringe is provided on one side. The flow of fluid as the plunger of the syringe is raised and lowered is shown diagrammatically. The valves are arranged so that flow is possible through the barrel in only one direction. Connectors at either end are of the proper diameter to fit standard intravenous tubing. The present model is constructed of nylon, allowing sterilization by either heat or chemicals. It weighs slightly less than one ounce and is capable of delivering more than 300 cc. per minute when operated manually with a 10-cc. syringe as the pump. (Author)

AD-260 670 Div. 16
(4 Aug 61) OTS price $2.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE EFFECT OF A YEAR IN THE ANTARCTIC ON HUMAN THERMAL AND METABOLIC RESPONSES TO AN ACUTE STANDARDIZED COLD STRESS,
by Frederick A. Milan, Robert W. Elsner, and Kaare Rodahl. Mar 61, 21p. incl. illus. tables, 14 refs. (Technical rept. 60-9)
Unclassified report

DESCRIPTORS: Antarctic regions, Physiology, *Body temperature, *Metabolism, *Geophysicists, *Stress (Physiology), Motor reactions, Man, *Exposure, Measurement.

The metabolic rate and thermal responses of eight healthy subjects exposed nude for 2 hours to a standard cold stress (17 + or - 1.0 C air temperature) were examined in the fall, winter, and spring at Little America V in the Antarctic. Mean body, average skin and foot temperatures increased significantly (P less than 0.05) over the year. Neither rectal nor finger temperatures were altered. There was a decrease (P less than 0.05) in heat production to meet the same thermal demands after 3 months in the Antarctic. Basal metabolic rates were unchanged. Obvious shivering observed in all subjects in the fall was almost absent in the winter and spring. It is suggested that these changes represent physiological adaptation to low ambient temperatures. (Author)

AD-260 787 Div. 16
(7 Aug 61) OTS price $1.10

Walter Reed Army Inst. of Research, Washington, D. C.
DETECTION OF ASYMPTOMATIC CORONARY DISEASE. Progress rept. on Internal Medicine, 1 July 60-30 June 61,
by D. O. Lynn and T. W. Mattingly. 30 June 61, 3p.
Unclassified report

DESCRIPTORS: Heart, *Blood circulation, Pathology, Detection, Medical examination, Lipids, Test methods.

A total of 300 officers on duty at Walter Reed Army Medical Center and the Pentagon, having entirely normal cardiovascular findings, including normal electrocardiograms, roentgenograms of heart, blood pressure, and routine cardiovascular examinations, were subjected to diagnostic studies in an effort to determine the presence

of any abnormality in theset tests that might uncover evidence of sub-clinical coronary artery disease. Studies consisted of electrocardiograms after a double two-step exercise test, BCG performed before and after a double two-step exercise test, determinations of lipoproteins and cholesterol values of the fasting blood sera. One Hundred male officers were in the age group 25-34, one hundred in the age group 35-44, and one hundred males 45 and over. It is believed a long term follow-up (25 years) may determine which or if any of the above tests are reliable in the early detection of coronary disease. The lipid studies were also performed on a group of patients in corresponding age groups with diagnosis of myocardial infarctions, angina, hypertensive cardiovascular disease, and arteriosclerosis obliterans. A control group of hospitalized patients with no evidence of cardiovascular disease was also studied as a control. A follow-up study and repeat lipid studies on the normal officers are in progress. (Author)

AD-260 788 Div. 16
(7 Aug 61) OTS price $1.10

Walter Reed Army Inst. of Research, Washington, D. C.
VALUE OF DOUBLE STANDARD TWO-STEP TEST IN DETECTING CORONARY DISEASE.
Progress rept. 1 July 60-30 June 61 of Internal Medicine,
by D. O. Lynn, T. W. Mattingly and others.
30 June 61, 4p.
Unclassified report

DESCRIPTORS: *Heart, *Blood circulation, Diseases, Detection, Exercise, Electrocardiography, Identification, Medical examination, Stress (Physiology), Test methods, *Diagnosis.

The current results of this follow-up study indicate that the postexercise electrocardiogram is a valuable aid in the diagnosis of coronary insufficiency - provided the only criterion used for the electrocardiographic diagnosis for coronary insufficiency is that of ischemic ST depression. This study definitely indicates that the other criteria as initially used by Master are not reliable and their use results in an over-diagnosis of coronary insufficiency. (Author)

AD-260 789 Div. 16
(7 Aug 61) OTS price $1.10

Walter Reed Army Inst. of Research, Washington, D. C.
PROGNOSIS OF BUNDLE BRANCH BLOCK AND CONDUCTION DEFECTS.
Progress rept. 1 July 60-30 June 61 on Internal Medicine,
by D. O. Lynn, M. D. Cheitlin and T. W. Mattingly.
30 June 61, 2p.
Unclassified report

DESCRIPTORS: *Heart, *Pathology, Etiology.

The Bundle Branch Block study was initiated to determine the etiology and prognosis of bundle branch blocks in general, the prognosis of specific types of bundle branch blocks, and the military usefulness of personnel with this diagnosis. (Author)

17. METALLURGY

AD-260 079 Div. 17, 25
(25 July 61) OTS price $7.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
A REVIEW OF RECENT RESEARCH AT GALCIT CONCERNING FRACTURE INITIATION.
Rept. for June 58-Dec 60 on Mechanics of Flight,
by M. L. Williams. Apr 61, 77p. incl. illus.
36 refs.
(Contract AF 33(616)5740, Proj. 7063)
(ARL-1) Unclassified report

DESCRIPTORS: Swept wings, Swept-back wings, *Stresses, Mathematical analysis, *Fracture (Mechanics), *Fatigue (Mechanics), Mechanics, Tensile properties, Elasticity, Deformation, Mechanical properties.

The mechanics of fracture initiation were investigated with particular emphasis on the effects of: combined bending and extensional stress on an isotropic or orthotropic cracked specimen; initial sheet curvature on the stress field in the vicinity of a crack; and size and shape of the yielded region, or plastic enclave, near the point of the crack. It was found that according to Reissner theory, the circumferential distribution of surface stresses at the tip of a crack in an isotropic plate subjected to bending is identical to the extensional stress distribution. Second, the initial curvature of a cracked plate was associated analytically and experimentally with an elastic foundation supporting a flat cracked plate. Third, analytical solutions for both internally and externally cracked infinite elastic orthotropic plates were obtained. Fourth, an analysis of the plastic enclave at the crack point in an isotropic sheet was conducted for an externally cracked specimen, using relaxation methods. The area of the enclave is presented as a function of applied tensile stress. Based upon the size of the enclave, the plastic strain energy is estimated, and a ductile fracture criterion is proposed. A theory of fracture initiation is proposed for high-stress, low-cycle fatigue which, as a natural result, distinguishes between different orders of load spectra. (Author)

AD-260 087 Div. 17, 12
(25 July 61) OTS price $4.60

Air Products, Inc., Allentown, Pa.
THE COMPATIBILITY OF VARIOUS METALS WITH LIQUID FLUORINE.
Rept. for June 60-15 Oct 60 on Finishes and Materials Preservation,
by C. J. Sterner and Alan H. Singleton. Mar 61, 42p. incl. tables, 15 refs.
(Contract AF 33(616)6515, Proj. 7312)
(WADD TR 60-819) Unclassified report

DESCRIPTORS: Aluminum alloys, Stainless steel, Steel, Titanium alloys, Copper alloys, Nickel alloys, Magnesium alloys, *Fluorine, Liquified gases, Corrosion, *Corrosion research, Contamination, Mechanical properties, Handling, Alloys, Metals, *Corrosive liquids, Corrosive gases.

Studies were made to determine the compatibility and resistance to corrosion of various metals with liquid Fl at -320F. Metals tested included various alloys of Al, stainless and high-strength steel, Ti, Cu, Monel, Ni, and Mg. It

was found that the total corrosion of Ti which had been exposed to liquid F1 was independent of time for periods up to 2 weeks. The corrosion of mg increased up to one day, but longer exposures up to 2 weeks produced no further corrosion. Increased corrosion of metals by F1 contaminated with water does not occur at liquid F1 temperatures, but takes place in the gas phase while the system is warming. F1 which had been liquefied in glass cells was found to contain solid material. Pretreatment with F1 gas is recommended since it can burn off surface contamination which might prove dangerous during liquid exposure. Abrading metal surfaces under liquid F1 with wire bristles caused no apparent increase in corrosion rate. (Author)

AD-260 200 Div. 17
(26 July 61) OTS price $3.60

Virginia Inst. for Scientific Research, Richmond.
THE ACCELERATED CORROSION OF METALS.
Quarterly rept. no. 7, 16 Mar-15 June 61, by Henry Leidheiser, Jr., and David A. Jackson, Jr. 14 July 61, 28p. incl. illus. tables.
(Contract DA 18-108-405-cml-518)
Unclassified report

DESCRIPTORS: *Metals, *Corrosion, *Aluminum, *Oxidation, Mercury compounds, Halides, Air, Iodides, Corrosion research, Humidity.

The oxidation rates of Al in air in the presence of HgI2 were studied over a relative humidity range of 40 to 100%. Measurements were made of time, temperature, and pressure at 5- to 10-min intervals until the oxidation slowed or completely stopped. The slopes of the linear portions of the rate curves were about the same at any particular relative humidity, however, as the relative humidity decreased, the slopes of the rate curves also decreased. At low relative humidities (55% and below) the extent of oxidation was very small. At high relative humidities, the oxide was voluminous, sometimes growing in one continuous thick blue-white column. At low relative humidities, the oxide consisted of short fibers, somewhat powdery and pure white in color.

AD-260 214 Div. 17
(27 July 61) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
FIBER-REINFORCED METALS AND ALLOYS.
Bimonthly rept. no. 1, 3 Apr-18 June 61, by T. J. Koppenaal and N. M. Parikh. 27 June 61, 12p. incl. illus. (Rept. no. ARF 2221-1)
(Contract NOw 61-0555-c)
Unclassified report

DESCRIPTORS: *Metals, *Alloys, Fibers, Reinforcing materials, Metallic textiles, Mechanical properties, *Silver, *Steel, *Copper, *Molybdenum, Wire, Plasticity, Deformation, Stresses, Hardening, *Stainless steel, Heat treatment, Determination.

Studies are being made of fiber-reinforced metals and alloys to evaluate their mechanical properties. The deformation characteristics of various composites were studied to determine: (1) the strengthening mechanism of the composite and (2) why the yield strength is dependent upon the type of fiber. Micro-yield measurements were made on composite specimens of Ag-10% mild steel and Ag-30% mild steel fibers (0.0025 to 0.003 in. in diameter, and on Ag with 30% fibers of mild steel, Mo, and heat-treated (hardened) type 410 stainless steel. The surface of a Cu-30% Mo fiber composite was polished and examined metallographically as a function of strain. Failed sections of Cu-10% and -40% Mo fiber composites were examined. Three important features in the deformation behavior of fiber-reinforced metals are: (1) for a given type of fiber, the rate of work hardening is highly dependent on fiber density at small plastic strains, and relatively independent of fiber density at high strains; (2) for the initial 2% elongation, deformation is restricted to the softer matrix; and (3) for a given matrix, fiber size, and fiber density, the yield strength at small strains is nearly independent of the type of fiber, but becomes significantly dependent at higher strains.

AD-260 226 Div. 17
(27 July 61) OTS price $3.00

Defense Metals Information Center, Columbus, Ohio.
THE EFFECTS OF ALLOYING ELEMENTS IN TITANIUM. VOLUME B. PHYSICAL AND CHEMICAL PROPERTIES, DEFORMATION AND TRANSFORMATION CHARACTERISTICS, by D. J. Maykuth, F. C. Holden, and others. 29 May 61, 150p. incl. illus. tables, 169 refs.
(DMIC rept. no. 136B)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: *Titanium alloys, Additives, Physical properties, Chemical properties, Electrical properties, Phase studies, Crystal structure, Deformation, Reaction kinetics, Phase transitions, Microstructure, Transition temperature, Diffusion, Alloys, Gas diffusion.

Data on the effects of alloying additions on the physical, electrical, and chemical properties of Ti alloys are reviewed. Information on the diffusion of interstitial elements in Ti and reliable diffusion data on the more important substitutional alloying additions are presented. The effects of alloying additions on the deformation mechanisms and textures, recovery, recrystallization, and grain-growth characteristics are analyzed. The effects of alloying additions on the martensitic, beta-to-alpha, beta-to-omega, and/or eutectoid transformation temperatures are discussed in terms of the reaction kinetics. (Author)

AD-260 313 Div. 17
(31 July 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF DUCTILE BERYLLIUM COMPOSITES.
Bimonthly rept. no. 3, 18 May-17 July 61, by Frank A. Crossley. 17 July 61, 2p. (Rept. no. ARF 2212-3)
(Contract NOw 61-0370-c)
Unclassified report

DESCRIPTORS: Beryllium, *Beryllium alloys, *Powder alloys, Silver alloys, Aluminum alloys, Mechanical properties, Sintered alloys, Sintering, Heat treatment, Powder metals, Powder metallurgy, Processing, Preparation, Binders, Bonding, Extrusion.

Further work towards the objective of producing ductile Be composites consisting of Be particles in a ductile matrix is described. Cylindrical compacts, 3/4 in. in diameter, are in preparation to provide information on the effects of variations in the processing procedure. Can-

didate Al-base and Ag-base matrix alloys were prepared for evaluation of their tensile properties in the age-hardened condition. A vacuum chamber is under construction so that liquid phase sintering in vacuo may be accomplished. (Author)

AD-260 421 Div. 17, 26
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
FORGEABILITY OF SOVIET MARTENSITIC AND SEMI-AUSTENITIC STAINLESS STEELS.
13 June 61, 3p. incl. illus. tables (AID rept. no. 61-90; Trans. from Investigation of the Technological Ductility of Stainless Steels, Kuznechno-shtampovochnoye proizvodstvo 4:9-12, Apr 61)
Unclassified report

DESCRIPTORS: *Stainless steel, *Steel, Forging, Austenite, Martensite, Processing, Deformation, Heat treatment, USSR, Mechanical properties.

The article deals with the forgeability of the Soviet martensitic and semiaustenitic steels. For comparison, a medium-carbon low-alloy steel was tested along with the others. Forgeability was evaluated on the basis of results of tensile, compression, and impact tests at temperatures of 600-1300 C. Indications are that the Soviets are at least attempting to employ their precipitation-hardenable steels for heavy forgings. The article also makes known for the first time the complete chemical compositions of 3 of their steels. (Author)

AD-260 425 Div. 17
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
NEW STEEL AND ALLOY SPECIFICATIONS.
29 June 61, 2p. (AID rept. no. 61-98; Trans. from New Materials of Ferrous Metallurgy. Standartizatsiya 3:53-56, Mar 61)
Unclassified report

DESCRIPTORS: *Steel, Alloys, Specifications, Tensile properties, *Stainless steel, *Heat resistant alloys, Sheets, Ship plates, Boron steel, Rods, Wire, Mechanical properties, USSR.

Thirteen new technical specifications for medium- and high-alloy steels and special alloys are listed. These were developed by the Central Scientific Research Institute of Ferrous Metallurgy, USSR. The minimum tensile strengths and elongations (in percent) are indicated for 12 of the specifications; in some cases the chemical composition is also indicated.

AD-260 473 Div. 17, 25
(1 Aug 61) OTS price $1.10

Stanford U., Calif.
STACKING FAULTS IN PLASTICALLY DEFORMED DILUTE SILVER ALLOYS,
by Mark J. Klein, John L. Brimhall, and Robert A. Huggins. Feb 61, 7p. incl. table, 16 refs.
(Technical rept. no. 1; DMS rept. no. 61-2)
(Contract Nonr-22534, Proj. NR 031-577)
Unclassified report

DESCRIPTORS: *Silver alloys, Plasticity, Deformation, *Silver, Lattices, Crystal structure, X-ray diffraction analysis, Additives, Magnesium, Copper, Oxygen.

Stacking faults were detected by x-ray measurements in cold rolled silver and dilute silver alloys. Small additions of magnesium, copper and oxygen were found to decrease the stacking fault probability of silver. Correlation of these observations with measurements of the twinning frequency and metallographic appearance suggests that the observed decrease in stacking fault probability is due to an increase in the relative stacking fault energy. (Author)

AD-260 474 Div. 17, 25
(1 Aug 61) OTS price $2.60

Stanford U., Calif.
THE STRUCTURE OF COLD WORKED SILVER AND SILVER-MgO ALLOYS,
by Mark J. Klein and Robert A. Huggins. June 61, 19p. illus. 27 refs. (Technical rept. no. 2; DMS rept. no. 61-9)
(Contract Nonr-22534, Proj. NR 031-577)
Unclassified report

DESCRIPTORS: *Silver, *Silver alloys, Plasticity, Deformation, Dispersion hardening, Lattices, Crystal structure, X-ray diffraction analysis, Magnesium compounds, Oxides, Magnesium alloys, Oxidation, Electrical properties, Resistance, Measurement.

Dislocation densities and configurations in plastically deformed silver and silver-magnesium oxide alloys were studied using x-ray line broadening measurements, correlated with other experimental techniques. The cold worked structure of the silver-magnesium oxide alloys was found to contain a large number of dislocations arranged to produce subgrains considerably smaller than the mean free path between oxide particles. This substructure is formed very rapidly in the early stages of deformation, and is accompanied by very little preferred orientation. (Author)

AD-260 475 Div. 17, 25
(1 Aug 61) OTS price $1.10

Stanford U., Calif.
CONTRIBUTION OF STACKING FAULTS TO RESISTIVITY IN SILVER,
by M. J. Klein, J. L. Brimhall, and R. A. Huggins. June 61, 5p. incl. tables, 26 refs.
(Technical rept. no. 3; DMS rept no. 61-10)
(Contract Nonr-22534, Proj. NR 031-577)
Unclassified report

DESCRIPTORS: *Silver, Lattices, Deformation, Electrical properties, Resistance, *Silver alloys, Copper alloys, Magnesium alloys, Oxygen, Additives, Crystal structure, Measurement, Scattering.

Resistivity measurements were made on small wire specimens of vacuum-melted high-purity Ag and dilute Ag alloys (less than 0.05% O2, 0.05% Cu, 0.05% Mg) at about 20 C to study the contribution of stacking faults to electron scattering. Values of the stacking fault probability and the increase in resistivity after severe plastic deformation (95% reduction in area) are tabulated. The data indicate that large changes in stacking fault probability are accompanied by very small differences in resistivity caused by imperfection scattering.

Since the imperfection scattering caused by plastic deformation of the alloys was not considerably smaller than that in the pure Ag, it is postulated that stacking faults do not contribute appreciably to the electrical resistivity of Ag deformed at room temperature.

AD-260 489 Div. 17, 20
(31 July 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE ROLE OF DILUTE BINARY TRANSITION ELEMENT ADDITIONS ON THE RECRYSTALLIZATION OF VANADIUM,
by Ernest P. Abrahamson, II. July 61, 11p. incl. illus. (Technical rept. no. WAL TR 830.3/3)

Unclassified report

DESCRIPTORS: *Vanadium, *Vanadium alloys, Additives, Crystallization, *Transition elements, Transition temperature, Nuclear states, Nuclear structure, Alloys, Phase transitions, Electron transitions, Solids, Solutions.

The effect of transition element binary solid solution additions upon the recrystallization temperature of V was investigated. Cr, Fe, Co, Ni, Mo, Ru, Rh, Os and Ir lower the recrystallization temperature, while Ti, Mn, Zr, Cb, Pd, Hf, Ta, W, Re and Pt raise it. The majority of elements have their greatest effect in less than 0.15 at.-%. Both the rate of change of recrystallization temperature with atomic percent solute and the limit of initial linearity are found to correlate with the free atom ground state outer electron configuration of the solute element. (Author)

AD-260 490 Div. 17, 20
(31 July 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE ROLE OF DILUTE BINARY TRANSITION ELEMENT ADDITIONS ON THE RECRYSTALLIZATION OF ZIRCONIUM,
by Ernest P. Abrahamson, II. July 61, 10p. incl. illus. (Rept. no. WAL TR 830.3/5)

Unclassified report

DESCRIPTORS: *Zirconium, *Zirconium alloys, Additives, Crystallization, *Transition elements, Transition temperature, Nuclear states, Nuclear structure, Alloys, Phase transitions, Electron transitions, Solids, Solutions.

The effect of transition element binary solid solution additions upon the recrystallization temperature of Zr was investigated. All additions raised the recrystallization temperature. A correlation is obtained between the logarithm of the rate of change of recrystallization temperature with atomic percent solute and the free atom ground state electron configuration of the solute element. (Author)

AD-260 491 Div. 17, 20
(31 July 61) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE ROLE OF DILUTE BINARY TRANSITION ELEMENT ADDITIONS ON THE RECRYSTALLIZATION OF COLUMBIUM,
by Ernest P. Abrahamson, II. July 61, 10p. incl. illus. (Technical rept. no. WAL TR 830.3/4)

Unclassified report

DESCRIPTORS: *Niobium, *Niobium alloys, Additives, Crystallization, *Transition elements, Transition temperature, Nuclear states, Nuclear structure, Alloys, Phase transitions, Electron transitions, Solids, Solutions.

The effect of transition element binary solid solution additions upon the recrystallization temperature of Nb was investigated. The elements Mn, Fe, Co, Ni, W, Re, and Os lower the recrystallization temperature, while Ti, V, Cr, Zr, Mo, Ru, Rh, Pd, Hf, Ta, W, Ir, and Pt raise it. A correlation is noted between the rate of change of recrystallization temperature with atomic percent solute and the free atom electron configuration of the solute element. (Author)

AD-260 547 Div. 17
(17 Aug 61) OTS price $1.60

Southern Research Inst., Birmingham, Ala.
AN INVESTIGATION OF THE CRACK-PROPAGATION RESISTANCE OF HIGH-STRENGTH ALLOYS AND HEAT-RESISTANT ALLOYS.
Bimonthly progress rept. no. 1, 23 Dec 60-23 Feb 61,
by P. C. Jenkins and J. D. Morrison. 17 Mar 61, 12p. incl. illus. tables. (Rept. no. 4861-1256-I)
(Contract NOw 61-0392-d)

Unclassified report

DESCRIPTORS: *Heat resistant alloys, Alloys, Mechanical properties, *Fracture (Mechanics), Steel, Refractory materials, Tensile properties, Sheets, Brittle materials, Fatigue (Mechanics), Chromium alloys, Nickel alloys, Molybdenum alloys, Titanium alloys, Aluminum alloys, *Iron alloys, Aging.

In the program outlined, the crack-propagation characteristics of a number of heat-resistant alloys and high-strength alloys will be determined at room temperature and at elevated temperatures using fatigue-cracked specimens. A listing of these alloys, which fall into three general groups, is given. These groups are: refractory metals, super alloys, and some special high-purity steels. Details of the experimental procedures to be used for these alloys are presented. An evaluation of the standard tensile properties and crack-propagation properties of aged A 286 alloy sheet, 0.040 in. thick, was made. It was found that the net fracture stress of fatigue-cracked specimens of this alloy is intermediate between the yield strength and ultimate strength at temperatures from 75 F to about 1000 F. At 1500 F, the net fracture stress of the fatigue-cracked specimens was somewhat higher than the ultimate tensile strength. (Author)

AD-260 580 Div. 17, 26
(2 Aug 61) OTS price $1.10

Solar Aircraft Co., San Diego, Calif.
DEVELOPMENT OF LOW TEMPERATURE BRAZING OF TUNGSTEN FOR HIGH TEMPERATURE SERVICE.
Interim rept. no. 1, 28 Mar-15 May 61,
by C. W. Haynes and A. G. Metcalfe. 23 May 61, 4p. (Rept. no. RDR 1249-1)
(Contract NOw 61-0414-c)

Unclassified report

DESCRIPTORS: *Tungsten, *Brazing, *Soldering alloys, *Platinum alloys, *Boron alloys, Silicon alloys, Tungsten alloys, Heat resistant alloys, Refractory materials, Eutectics.

The platinum-alloy reactive braze system (Pt-B-W) is being investigated to: (1) study the effect of B content, (2) study the effect of mode of W addition, (3) develop diffusion treatment, (4) determine optimum joint thickness, and (5) develop alloys based on information derived from preceding studies. Preliminary tests on Pt-2 to 6%B indicate that the maximum usable B content is about 4.5%. The Pt-3.6B alloy was used in studying the effect of the mode of W addition. The particle size of the W powder is not critical for sizes below 74 microns for heating rates in the 25 to 200 F/min range; the amount of W powder reactant added is critical. Study on diffusion treatments is dependent on the B and W studies, however, preliminary work on recrystallization cycles was begun with 0.020-in.-gage W sheet samples heated at various temperatures and times in an inert atmosphere. Four cycles were completed: (1) 2300 F, 10 min, (2) 2400 F, 1 min, (3) 2400 F, 10 min, and (4) 2500 F, 1 min. None of these cycles resulted in serious recrystallization although the latter 2 appeared to be in the beginning stages.

AD-260 594 Div. 17, 26
(2 Aug 61) OTS price $.75

Watertown Arsenal Labs., Mass.
EFFECT OF HOT EXTRUSION PROCESS VARIABLES ON 4340 STEEL,
by Roger A. Gagne and Samuel Valencia. May 61, 28p. incl. illus. tables (Technical rept. no. WAL TR 330.2/1)
Unclassified report

DESCRIPTORS: *Steel, *Extrusion, Processing, Deformation, Dies, Temperature, Mechanical properties, Pressure, Heat treatment, Microstructure.

AD-260 597 Div. 17, 26
(2 Aug 61) OTS price $1.60

Vitro Labs., West Orange, N. J.
SUBMICRON SIZED PARTICLES.
Interim technical engineering rept. 15 Mar-30 June 61,
by J. D. Holmgren, J. O. Gibson and R. Weidman. July 61, 14p. incl. illus.
(Contract AF 33(600)42916)
(AMC TR 7-884,*vol. 1) Unclassified report

DESCRIPTORS: *Powder metals, *Refractory materials, Carbides, Oxides, Aluminum, Silicon compounds, Aluminum compounds, Thorium compounds, Tantalum compounds, Tungsten, Production, Tungsten compounds, Particles, Electrodes, Preparation, Electric arcs, Vacuum apparatus, Metals, Vaporization, Powders.

Work was initiated on the preparation of high purity submicron size powders of refractory and non-refractory materials in the 1000 to 100 angstrom size range. Sample quantities of various submicron refractory oxides were prepared using the arc vaporization technique. Preliminary testing was started for application of this technique for preparation of submicron size refractory metal and carbide powders. Surveys were carried out to determine the state-of-the-art for the production of submicron size powders. When the survey results are complete, the data will be analyzed to establish the relative advantage of the various processes for economical production of high purity submicron materials. (Author)

AD-260 632 Div. 17, 26
(4 Aug 61) OTS price $4.60

Lockheed Aircraft Corp., Marietta, Ga.
FORGING MAGNESIUM ALLOYS.
Quarterly progress rept. no. 13 on Phase IA, by W. A. Hamilton and R. F. Woolf. 30 June 61, 47p. incl. illus. tables.
(Contract AF 33(600)36577)
Unclassified report

DESCRIPTORS: *Magnesium alloys, *Forging, Mechanical properties, Tensile properties, Determination, Fatigue (Mechanics), Tests.

Following up an investigation of the Mg forging alloy HM21, an investigation of the alloy EK31 has been performed and a limited test program accomplished. The EK31 alloy possesses good forging characteristics. Room temperature yield and ultimate strength values are slightly below those of ZK60. Mechanical properties drop off sharply as temperature increases; however, the 600 F ultimate and yield strength is 5 to 10% better than that of HM21. (Author)

AD-260 693 Div. 17, 26, 27
(7 Aug 61) OTS price $12.50

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
HIGH STRENGTH MBMC #1 STEEL HYDROTEST CASE EVALUATION, METALLURGICAL PROPERTIES AND MACHINABILITY,
by E. S. Mills. 14 July 61, 171p. incl. illus. tables (Proj. rept. no. SPDIR-25)
(Contract NOrd-15719)
Unclassified report

DESCRIPTORS: *Rocket cases, *Steel, Physical properties, Mechanical properties, Machining, Welding, Hydroforming, Processing, Design, Heat treatment, Surface properties, Controlled atmospheres, Tests, Booster rocket cases, Test methods, Booster rockets, Hydrostatic pressure.

This report includes:
Michigan U. Coll. of Engineering, Ann Arbor.
COMPARATIVE MACHINABILITY OF MBMC-1 AND AISI 4130 STEEL. Final rept., by L. V. Colwell and K. N. Sederlund. Oct 60, 1v. incl. illus. tables.
(Subcontract to Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich, Contract NOrd-17519)

An ultra high strength steel suitable for the fabrication of missile cases and components was investigated. An evaluation was made on fabrication of hydrotest cases by both rolled and welded, and hydrospin processes, and was limited to the machinability, metallurgy, welding, spinability and hydrotesting of MBMC #1, a high Si lean alloy steel. Physical and mechanical properties of MBMC #1 steel are presented. A machinability study was completed comparing MBMC #1 steel with AISI 4130 steel. Fifty-five production prototype hydrotest cases were fabricated; 23 by the conventional rolled and welded process, and 32 by the power spinning process. The test proved that the material, with proper heat treatment, can produce a high strength steel case by the rolled and welded or hydrospun methods of fabrication. (Author)

AD-260 773 Div. 17, 26, 1
(7 Aug 61) OTS price $9.10

Republic Aviation Corp., Farmingdale, N. Y.
IMPROVED METHODS FOR THE PRODUCTION OF TITANIUM ALLOY EXTRUSIONS.
Interim technical engineering rept. no. 17,

1 Apr-1 July 61,
by Murray H. Levine. July 61, 111p. incl. illus. tables.
(Contract AF 33(600)34098)
(AMC TR 7-556, vol. 17) Unclassified report

DESCRIPTORS: *Titanium alloys, *Extrusion, Manufacturing methods, Airframes, Materials, Production, Contamination, Coatings, Glass, Oxygen, Chemical reactions, Surface properties, Tensile properties, Heat treatment, Creep, Fatigue (Mechanics), Tests, Induction heating, Drawing (Machine processing), Configurations.

Extrusion of 1/8-in 7Al-4Mo Ti alloy T shapes (Group 16) was successfully completed on a semi-production basis. Extrusion of thinner Part IV Ti alloy T shapes has been realized. Straightening trials were conducted on the Group 16 extrusions. The straightened extrusions were comparable to previous straightened extrusions with an over-all bow ranging from 1/2 to 2 in. in a 14-ft length. Micro-examination studies indicate that O contamination of the billet occurs during heating, as a reaction between the glass coating and the Ti billet surface. Such contamination is visible on the extruded surface. Installation of the 100 kw induction heating unit and preparation for warm drawing trials will be completed shortly. Mechanical test data for extrusions straightened in the temperature range of 1000 to 1500 F are reported for room and elevated tensile, creep tests and flexure fatigue. The flexure fatigue results for 3 types of extrusion surfaces are reported. (Author)

AD-260 794 Div. 17, 25
(8 Aug 61) OTS price $1.00

Materials Research Corp., Yonkers, N. Y.
THE INVESTIGATION OF THE MECHANISM OF SUBSTRUCTURAL FORMATION IN REFRACTORY METALS AND THE RELATION TO THE OBSERVED MECHANICAL PROPERTIES. Rept. for July 59-July 60, on Metallic Materials,
by M. A. Adams and A. Iannucci. Dec 60, 28p. incl. illus. tables.
(Contract AF 33(616)5908, Proj. 7351)
(WADC TR 59-441, pt. 2) Unclassified report

DESCRIPTORS: Metallic crystals, *Molybdenum, Single crystals, Crystals, Crystal structure, Creep, Mechanical properties, Zone melting, Electron bombardment, Microstructure, Solid state physics, Refractory materials, Lattices, Deformation.

An apparatus is described for preparing 9-in.-long Mo crystals by floating-zone electron-bombardment melting. An assessment was made of the effects of (a) quality of starting material, (b) speed of growth, and (c) molten zone size on crystal perfection and purity. Three etch-pit techniques for revealing dislocations and sub-boundaries in Mo: (a) chemical etching in potassium ferricyanide-sodium hydroxide, (b) electro-etching in sodium hydroxide, and (c) electro-etching in oxalic acid, have been investigated. All of the techniques appear to give the same sub-boundary configurations, but etching treatments (c) produces more random etch-pits than the treatments (a) and (b). Comparative creep tests were made at 1000 C on "as-grown" and polygonized beam-melted Mo crystals. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-260 063 Div. 18, 30
(21 July 61) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
THE STRUCTURING AND ANALYSIS OF COMPLEX SYSTEM PROBLEMS,
by K. H. Schaeffer and Albert Shapero. May 61, 25p. incl. illus. 11 refs.
(Contract AF 49(638)1020)
(AFOSR-810) Unclassified report

Presented at the Operations Research Society of America, Nineteenth National Meeting, Chicago, Illinois, 25-26 May, 1961.

DESCRIPTORS: *Operations research, Information theory, Computers, Mathematical computer data, Analysis, Design, Human engineering, Conferences.

Many complex systems consist of too many different types of elements and are influenced by too many factors to lend themselves readily to conceptualization through mathematical models, without introducing unrealistic oversimplifications. To structure such systems realistically, an approach has been developed which begins with the classification of the elements affecting the system and the determination of the existence of certain types of relations between these elements. The approach which is known as the System Analysis and Integration Model (SAIM) has been applied to the analysis of a number of system problems concerning weapon system development, including command and control. Other problem areas to which the method has been applied are the analysis of postattack recovery, political conflicts, and large-scale organizations. The paper concludes with a discussion of the function of this general approach in the development of formal models which realistically represent complex system problems. (Author)

AD-260 086 Div. 18, 6, 8, 1
(26 July 61) OTS price $2.60

Dunlap and Associates, Inc., Stamford, Conn.
THE EVALUATION OF OPERATOR AND SYSTEM PERFORMANCE DURING THE PHASE I, CATEGORY II FIELD TESTING OF THE 412L AIR WEAPONS CONTROL SYSTEM. A METHODOLOGICAL REPORT,
by Alin Gruber, Robert T. McCay and others.
June 61, 21p. incl. illus. table.
(Contract AF 19(604)3029)
(AFESD TR 61-27) Unclassified report

DESCRIPTORS: *Ground controlled interception systems, Test methods, Radar tracking, Data processing systems, Radio communication systems, Search radar, Radar equipment, Airborne, Early warning radar, Data, Personnel, Training, Analysis, Programming, Data transmission systems, Flight testing, *Aircraft intercept control systems, *Antiaircraft defense systems, Command systems.

The approach and methods used to evaluate a multi-site, semi-automatic air weapons control system are described. Following a description of the system, the measures used in evaluating system performance are discussed. The importance of analyses of system and subsystem functioning is mentioned with regard to determining both the data to be collected and also the method of collecting them. The data collected during the sys-

tem testing are enumerated. Procedures used in collecting the data are discussed. Attention is drawn to the advantages of specifying in advance what observations are required, the form in which these observations are to be recorded, and the training of data collectors. The procedures used in programming for the data reduction and analysis are discussed. (Author)

AD-260 132 Div. 18, 30
(25 July 61) OTS price $5.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. VI. A PROPOSED PROCEDURE FOR RECORDING TRUE USAGE DATA,
by J. E. Hamilton. 18 July 61, 46p. incl. tables, 10 refs. (Serial no. T-131/60)
(Contract Nonr-76105, Proj. NR 047-001)
Unclassified report

DESCRIPTORS: *Naval logistics, Naval research, *Logistics, Data, Collecting methods, Naval supplies, *Reports, *Records, Naval vessels, Processing.

AD-260 202 Div. 18, 30
(26 July 61) OTS price $6.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. V. THE REDUCTION OF USAGE DATA,
by J. E. Hamilton. 29 June 61, 64p. (Serial no. T-129/60)
(Contract Nonr-76105, Proj. NR 047 001)
Unclassified report

DESCRIPTORS: *Naval logistics, *Logistics, Naval research, Data, Collecting methods, Naval supplies, *Reports, *Records, *Military publications, Naval shore establishments, Naval vessels, Classification, Processing.

AD-260 587 Div. 18, 15, 12
(3 Aug 61) OTS price $1.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
DEFENSE OF RETALIATORY FORCE,
by Joel S. Greenberg. June 61, 15p. incl. illus. (RADC TN 61-66)
(Proj. 7991)
Unclassified report

DESCRIPTORS: Armed Forces, Guided missiles, Survival, Probability, Analysis, Effectiveness, Surface to surface, *National defense, Mathematical prediction, *Launching sites.

In the near future the United States will have a retaliatory force composed primarily of a large number of ballistic missiles in fixed, hardened sites. The survivability of a desired portion of this force is a function of the number of United States and enemy missiles and the lethal radius and accuracy of the enemy missiles. A desired level of force survival can be accomplished in many ways, two of which are the defense of the original force, or the increase in size of the original force. Under certain conditions, increasing numbers of missiles in the retaliatory force will suffice to provide a given level of force survival, and under a modified set of conditions active defense of the retaliatory force is necessary in order to provide the same level of survivability. An attempt is made in this report to determine what the conditions are when either of the above approaches are desirable. (Author)

19. NAVIGATION

AD-260 171 Div. 19, 8
(26 July 61) OTS price $8.10

New Mexico U. Engineering Experiment Station, Albuquerque.
COMPARISON OF PULSE AND FM RADAR ALTIMETERS BASED ON TERRAIN RETURN THEORY.
Master's thesis,
by David L. Quinlan. May 61, 85p. incl. illus. table (Technical rept. no. EE-56)
(Contract N123-60530-18138A)
Unclassified report

DESCRIPTORS: *Radio altimeters, *Terrain, Radar pulses, Frequency modulation, Radar navigation, Radiofrequency spectrum analyzers, Fourier analysis, Transformations (Mathematics), Functions, *Radar signals, Electromagnetic waves, Electromagnetic wave reflections, Theory, Mathematical analysis, *Radar reflections, *Radar equipment.

Theoretical expressions are employed in describing radar terrain return at near-vertical incidence as a basis for comparing pulse and FM radar altimeters. The relationships resulting from a comparison of this nature will facilitate application of the extensive information gained in pulse radar return studies to the investigation of FM radar terrain return, and the associated design of FM radar altimeters. The theoretical expressions are first considered individually for each radar system, and then compared under identical operating conditions. The similarity of the returns, as presented on a pulse radar-A-scope and an FM radar spectrum analyzer, suggests a method of comparing the 2 radar systems; for, if properly manipulated, the expressions for return are identical in mathematical form. With this relationship between the expressions for terrain return as a basis of comparison, additional relationships are obtained by considering similar alteration and Fourier transformation of the related expressions, and the system functions associated with these operations. (Author)

AD-260 172 Div. 19, 8
(26 July 61) OTS price $8.60

New Mexico U. Engineering Experiment Station, Albuquerque.
RADAR TERRAIN RETURN FROM THE SPHERICAL EARTH AT NEAR-VERTICAL INCIDENCE.
Master's thesis,
by B. D. Warner. May 61, 90p. incl. illus. 11 refs. (Technical rept. no. EE-46)
(Contract N123-60530-18138A)
Unclassified report

DESCRIPTORS: *Radio altimeters, *Terrain, Surface properties, Equations, Integral equations, Spheres, Earth, Probability, Electromagnetic waves, Scattering, Statistical analysis, Functions, High altitude, Reflection, *Radar signals, Theory, Radar navigation, *Radar reflections, *Radar equipment.

A scalar equation for the power returned to a radio altimeter is developed by probability methods to explain the scattering mechanism of the earth's surface at any altitude, including altitudes such that the sphericity of the earth becomes an important factor. The power return equation is resolved into a specular component plus a random or scatter component. The relative magnitudes of these components depend upon the surface roughness of the irradiated target. It is not expected that the scattering cross-section will be independent of large changes in altitude in practical applications. The irradiated target area increases as the radar altitude increases, thus changing the statistical information available to the radar. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-260 303 Div. 20, 8
(28 July 61) OTS price $12.00

Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELECTRONIC COMPONENTS,
by D. J. Hamman, W. E. Chapin and others.
1 June 61, 162p. incl. illus. tables, 109 refs.
(REIC rept. no. 18)
(Contract AF 33(616)7375)
Unclassified report

DESCRIPTORS: *Electronic equipment, Radiation damage, *Radioactivity, *Electron tubes, Resistors, Capacitors, Transformers, Piezoelectric crystals, Electronic relays, Electronic switches, Electric insulating, Electric connectors.

The state of art of knowledge on the effects of nuclear radiation on basic electronic parts is summarized. The results are intended to provide a basis for judging the merits of the parts when they are to be used in circuitry that will be exposed to a radiation environment. Some of the data can be considered as design oriented to the extent that they indicate radiation levels at which the parts can be expected to perform satisfactorily. (Author)

AD-260 538 Div. 20
(3 Aug 61) OTS price $1.10

Naval Research Lab., Washington, D. C.
A COMPARISON OF THE NEUTRON BEAMS FROM A RADIAL BEAM PORT AND FROM THE TANGENTIAL PORT OF THE NRL REACTOR AS SOURCES FOR NEUTRON-CAPTURE GAMMA RAYS.
Final rept.,
by R. H. Vogt. 22 June 61, 7p. incl. illus. table (NRL rept. no. 5632)
Unclassified report

DESCRIPTORS: *Neutrons, Thermal neutrons, *Neutron beams, *Neutron capture, Neutron flux density, *Gamma emission, Gamma rays, Gamma ray spectra, Nucleons, Collimators, Particles, Nuclear reactions, *Research reactors, Gamma ray spectra, *Beam holes, Diffusion.

In the electron-volt region of neutron energies the neutron beam from a radial port (the one designated R-3) provides low-energy capture gamma rays from heavy nuclides which have intensities from 2 to 6 times those given by the beam from the parallel tangential port striking the same target materials. The signal to background ratios are comparable in the two cases for the geometries used. The intensities of high-energy gamma rays in the direct beam from R-3 are from 5 to 10 times that of the same-energy gamma rays in the tangential beam. (Author)

AD-260 595 Div. 20, 25
(2 Aug 61) OTS price $3.60

Washington U., St. Louis, Mo.
POLARIZATION IN NUCLEAR SCATTERING,
by Richard G. Allas. July 61, 36p. incl. illus. 60 refs. (Technical rept. no. 1)
(Contract AF 49(638)843, Proj. 9751)
(AFOSR-965) Unclassified report

DESCRIPTORS: *Nuclear spins, Matrix algebra, Particles, *Scattering, *Polarization, *Inelastic scattering, Quantum mechanics, Operators (Mathematics).

Any particle with intrinsic spin (s is not 0) can align its spin axis in certain directions relative to an axis of quantization. Beams of identical particles will in general have all possible spin directions randomly represented unless some sorting mechanism has been employed. A beam of particles that has all spin directions represented with equal probability is said to be unpolarized. If all spins align up along some preferred direction we call the beam completely polarized. If some spin direction is more preferred than others we have a partially polarized beam. In order that polarization be a useful concept we must define it in a more systematic way - give it a quantitative measure for the above expressed qualitative ideas. Polarization experiments limited mostly to nuclear scattering are discussed. Physical ideas are used to explain the mathematical formalism. Attention is concentrated on discussing the scattering matrix M(theta, phi). (Author)

AD-260 649 Div. 20
(3 Aug 61) OTS price $1.10

Pennsylvania State U., University Park.
SHORT-LIVED ACTIVITIES INSTRUMENTATION AND TRITON. INITIATED REACTIONS.
Final technical rept., 1 Nov 57-31 May 61,
by Rolf G. Winter. 15 June 61, 5p.
(Contract DA 36-061-ORD-592, Proj. TB2-0001(1911))
(AROD rept. no. 1911:4) Unclassified report

DESCRIPTORS: *Equations of state, *Radioactive decay, Radioactive decay constant, *Nuclear physics, *Proton reactions, Protons, Radioactivation analysis, Fast neutrons, Fluorine, Isotopes, *Tritons, Tritium.

Contents:
Recoil proton initiated reactions
Evolution of a quasi-stationary state
Gas circulating system
Decay of f-20
Triton initiated reactions

Division 21 - NUCLEAR PROPULSION
Division 22 - ORDNANCE

AD-260 705 Div. 20, 25
(4 Aug 61) OTS price $9.60

Illinois U., Urbana.
THE HIGH FREQUENCY LIMIT OF 15.1 MEV • BREMSSTRAHLUNG,
by H. E. Hall and A. O. Hanson. June 61, 106p. incl. illus. tables, 53 refs. (Technical rept. no. 26)
(Contract Nonr-1834(05)
Unclassified report

DESCRIPTORS: Carbon, *Bremsstrahlung, Photons, *Nuclear reactions, Thorium, Nuclear physics, Betatrons, Polarization, Beams, Monitors, Detection, Scattering, Inelastic scattering.

The 15.1 Mev scattering resonance in carbon is used to study the yield of photons at the high frequency limit of the bremsstrahlung spectrum. A survey of the yield from several elements was carried out at 0 degrees where the yield at the limit increased strongly with the atomic number. The yield in the forward direction is strongly dependent on the effective target thickness and is, therefore, difficult to interpret. More detailed measurement of the 15.1 Mev isochromats from a thin thorium (Z = 90) target at several angles, are presented and compared with the available calculation; a value of 1.61 ± 0.16 mb is obtained for the total cross section at the tip. This is in reasonable agreement with a theoretical value of 1.96 ± 0.38 mb based on the inverse photoeffect and 1.2 mb as obtained by a direct evaluation in the extreme relativistic limit. (Author)

AD-260 763 Div. 20, 25, 30
(7 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
A TECHNIQUE FOR INCREASING THE SENSITIVITY OF A SOLID-STATE FISSION PROBE,
by Robert Steinberg. Aug 61, 11p. incl. illus.
(NASA TN D-1054)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA TN-D-1054.

DESCRIPTORS: Silicon, *Transistors, *Fission, Uranium, Solid state physics, Neutron flux density, *Semiconductors, *Instrumentation, *Neutron detectors, Thermal neutrons.

It has been observed that the sensitive area of a semiconductor fission probe can be increased many times by utilizing a series technique in the fabrication of the detecting element. Large area detectors (circa 1 sq cm) have been constructed with a corresponding thermal neutron sensitivity of 0.00090 counts/neutron/sq cm. (Author)

21. NUCLEAR PROPULSION

No Entries

22. ORDNANCE

AD-260 021 Div. 22, 26
(24 July 61) OTS price $1.10

Naval Ordnance Test Station, China Lake, Calif.
THE WEDGE-RING JOINT,
by W. Hillmer. June 61, 7p. incl. illus.
(NOTS TP 2643; Technical article no. 12)
Unclassified report

DESCRIPTORS: *Torpedoes, *Joints, Design, Wedges, Rings, Metal joints, Torpedo cases.

A new method of joining sections of torpedoes is presented. The wedge-ring joint has advantages over previous joints in size, weight, and ease of assembly. The joint provides a smooth joining surface; therefore, it reduces water turbulence around the torpedo, making it more effective. (Author)

AD-260 052 Div. 22
(24 July 61) OTS price $9.10

Rock Island Arsenal Lab., Ill.
LITTLEJOHN PHASE II LIGHTWEIGHT SYSTEM ROCKET HANDLING AND ANCILLARY EQUIPMENT (SOSR).
Notes on Development Type Materiel.
June 61, 106p. incl. illus.
Unclassified report

DESCRIPTORS: *Artillery rockets, Handling, Rocket launchers, Trailers, Missile launchers, Hoists, Tool kits, Tools, Protective coverings, Thermal insulation, *Maintenance equipment, Solid rocket propellants, Air conditioning equipment, Heating plants, Rocket heads, Operation, Shipping, Mobile.

Description, operating procedure and other pertinent information pertaining to ancillary equipment for use with the Little John system are given. The information deals directly with use of the equipment with the Phase II Little John system but is not necessarily limited to that system. The following pieces of equipment are discussed: 318-mm rocket, transport cart assembly; truck-mounted 318 mm rocket, handling unit; rocket conditioning kit; thermal insulating blanket; rocket-handling lift bar set; cargo basket; tripod hoisting unit; launcher cover; trailer cover; lifting slings; rocket-handling slings; warhead mating fixture; tools and related equipment. Shipping procedures are also mentioned.

AD-260 137 Div. 22, 6
(17 July 61) OTS price $4.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
BALLISTIC CALCULATIONS AND DESIGN CRITERIA FOR DECOY LAUNCHING SYSTEMS,
by C. L. Fulton and S. Goldstein. Feb 61, 44p. incl. illus. tables (Rept. no. R-1578)
(ARPA order no. 39-59, Task 8)
Unclassified report

DESCRIPTORS: Ballistics, *Explosive actuators, Propelling charges, Recoilless rifles, Design, *Guided missiles, Surface to surface, *Catapults, Packaging, *Release mechanisms, Radar confusion reflectors, *Ejector cartridges, Theory, Launching, Gun launched, Aluminum, Titanium.

A study was made concerning the use of ballistic systems in launching diversionary objects from ballistic missiles. It was concluded that the use of standard cartridge-actuated devices (CAD) as decoy launchers is entirely feasible, with each particular unit covering a certain weight-velocity range. The design of a reactionless launcher to cover any specific weight-velocity combination is possible for the ranges tabulated. This launcher could be either spigot or full-caliber, depending on the weight-velocity range desired. It was concluded that the use of a high-low ballistic spigot system is not desirable where a smaller caliber direct system can be used. If launcher weight or the G loading on the decoys is critical and a spigot design is used, the open spigot will give reduced values, in which case, the use of a high-low ballistic system may be desirable. In fact, the pressures may become so low that the use of compressed gas or a mechanical system is recommended. Equal or greater launcher weight savings can be obtained by choosing aluminum or titanium over steel. (Author)

AD-260 264 Div. 22, 8
(28 July 61) OTS price $3.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
PRECISION RF SENSITIVITY STUDIES (EVALUATION OF MARK 1 SQUIB AND MARK 2 MOD 0 IGNITION ELEMENT). Quarterly progress rept. no. 2, 1 Feb-1 May 61, by Paul F. Mohrbach and Robert F. Wood. 1 May 61, 28p. incl. illus. tables (Rept. no. Q-B1805-2)
(Contract N178-7830)
Unclassified report

DESCRIPTORS: *Electric detonators, *Electric igniters, Radiofrequency, Sensitivity, Radiofrequency power, Impedance matching, Thermocouples, Standing wave ratios, Instrumentation, Very high frequency, Ultra high frequency, Test equipment, *Test sets, Calibration, Electronic equipment, Coaxial cables, Measurement, Transmission lines, Tests, Calorimeters, Tuning devices, Heaters.

An evaluation was made of matching devices to be used in the evaluation of the MARK 1 squib and the MARK 2 MOD 0 ignition element, as to sensitivity to RF. A discussion of losses in several types of coaxial impedance matching devices used in the 250 to 500 mc range is presented. The efficiency of three such devices is expressed in terms of the percentage of incident RF power delivered to a series of thermocouple terminations. All of the tuners are lossy when matching lower resistance thermocouple heaters. The efficiency of a tuner was on the order of 35 to 45% when used to match a 0.2 ohm load to the laboratory source. The percentage of incident power which reaches the thermocouple heaters when no matching is employed was investigated. A method for calculating the SWR introduced by these unmatched terminations is outlined. These data are then combined with matching efficiency data of the tuner to show correlation between SWR and tuner efficiency. (Author)

AD-260 394 Div. 22, 20, 6
(31 July 61) OTS price $1.60

Rand Corp., Santa Monica, Calif.
QUESTIONS FOR THE VELA PROGRAM ON DECOUPLING OF UNDERGROUND EXPLOSIONS,
by Albert L. Latter. 2 Nov 60, 7p. (Rept. no. RM-2659)
(Contract AF 49(638)710)
(ARPA Order no. 91-59) Unclassified report

Presented before the VELA Technical Symposium at Washington, D. C., October 4-5, 1960.

DESCRIPTORS: *Underground explosions, Detection, Nuclear explosions, Explosives, *Seismic waves, Plasticity, Shock waves, Chemicals, Blast, Pressures.

A discussion is presented concerning the implications of, and questions raised by, the cowboy underground detonations with chemical explosives. These experiments verified the correctness of the theory that explosions in a large cavity experience a decoupling effect, that is, the resulting seismic signals are muffled. The Cowboy tests left certain problems still to be solved (e.g., the relationship between cavity volume and depth and the decoupling factor, and the possibility that chemical explosions produce significantly different curves from nuclear explosions under the test conditions). (Author)

AD-260 405 Div. 22
(1 Aug 61) OTS price $2.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
EVALUATION OF STORAGE CHARACTERISTICS OF PA-101 AND PA-101D PRIMER COMPOSITIONS,
by William F. McGarry and Edmund P. Vail. July 61, 29p. incl. illus. tables (Technical rept. no. DR-TR: 4-61)
(Proj. 252.9501.2600.311)
Unclassified report

DESCRIPTORS: *Primers, Storage, Tests, Sensitivity, Stability, *Delay powders, Grenade fuzes, Lead compounds, Styphnates.

Primer compositions PA-101 (basic lead styphnate barium nitrate/antimony sulfide/tetracene/aluminum) and PA-101D (dichromated Al added) proved to have low impulse and gas volume values. These are two characteristics of a primer composition that consistently initiate delay compositions in an obturated system. The primer compositions were stable when subjected to storage at extreme temperatures over a period as long as one year. M42 Primers when loaded with 20 mg of either PA-101 or PA-101D and consolidated at 6,000 psi will consistently initiate Type II Zr-Ni alloy delay compositions. The PA-101D dichromated composition appears to be equivalent to plain PA-101 and in addition has better flow properties. (Author)

AD-260 701 Div. 22
(7 Aug 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
SOME ASPECTS OF THE DECAY OF PHOSPHORESCENCE,
by J. Steinberg and E. L. Offenbacher. July 60, 20p. incl. illus. (Technical memo. no. M61-7-1)
(Proj. TS4-4024)
Unclassified report

DESCRIPTORS: Memory devices, Phosphorescence, Recoilless rifles, Fire control systems, *Gun directors, *Target position indicators, *Phosphorescent decay, Ballistics, Mathematical analysis, Spotting rifles, Phosphors, Phosphorescent materials.

In order to obtain an efficient memory device for use with the spotting rifle of recoilless weapon systems, a study was made to determine the mechanisms and parameters affecting the persistence of phosphorescence and methods of maximizing the persistence for a given energy of excitation. An expression is derived for the maximum persistence obtainable for a given energy input in terms of the decay constant of the phosphor and it is shown that the problem of maximizing the persistence is related to the problem of minimizing the energy needed for any desired persistence. The maximum useful range for the memory device applied to the spotting weapon of a recoilless weapon system is discussed. (Author)

AD-260 772 Div. 22
(7 Aug 61) OTS price $4.60

Rock Island Arsenal Lab., Ill.
ARTILLERY WEAPON SYSTEMS APPLIED RESEARCH IMPULSE GENERATOR RECOIL BRAKE (105MM HOWITZER, M2A2) (PHASE B. EXPERIMENTAL TESTING),
by H. G. Noble, Jr. Apr 61, 41p. incl. illus. tables (Rept. no. 61-1348)
(Proj. TB4-0001)
Unclassified report

DESCRIPTORS: Artillery, *Recoil mechanisms, *Howitzers, Tests, Test methods, Pneumatic systems, Rocket motors, Pulse generators.

Experimental testing of an impulse generator as a supplementary recoil brake to a hydropneumatic recoil mechanism was accomplished. Testing was conducted utilizing the 105mm howitzer carriage materiel, M2A2, with a modified recoil mechanism as the test vehicle. The T-266 rocket motor was used as the impulse generator. The results of experimental testing substantiate the conclusions of Phase A, theoretical analysis, in regard to the feasibility of this concept. The use of an impulse generator as a supplementary recoil brake resulted in a reduction of approximately 50% to the force transmitted to the undercarriage of the weapon. Indications are that there are no detrimental effects on the accuracy of the weapon as a result of the impulse generator action. The weapon appears to be more stable when utilizing the impulse generator. The pressure as a result of the rocket firing is less than that associated with a muzzle brake. (Author)

23. PERSONNEL AND TRAINING

AD-260 315 Div. 23, 30, 6
(31 July 61) OTS price $3.60

American Inst. for Research, Pittsburgh, Pa.
TRAINING REQUIREMENTS FOR THE DEVELOPMENT OF PROTOTYPE SELF-INSTRUCTIONAL PROGRAMS COVERING BASIC JOB KNOWLEDGE FOR SAGE TRACK MONITOR AND INTERCEPT DIRECTOR OPERATOR POSITIONS,
by Harris H. Shettel, David Angell and others. Mar 61, 40p. incl. tables (Rept. no. AIR-C11-61-SR-246)
(Contract AF 19(604)5951)
(ESD TN 61-52) Unclassified report

DESCRIPTORS: *Training, Radar operators, Analysis, Teaching machines, Simulation, Programming, *Ground controlled interception systems, Military requirements.

This report describes the steps and procedures used in analyzing the Track Monitor and Intercept Director tasks in order that appropriate self-instructional training programs covering basic job knowledge could be prepared for each of these two SAGE operator positions. It presents the rationale for the categorization of each task into segments and the ultimate ordering and structuring of these segments in the final self-instructional programs. Also described are methods by which changes in the self-instructional materials were incorporated in order to account for new and/or modified job procedures which result from SAGE model changes. Additional suggestions for accommodating changes are made. Two Primers, one covering basic knowledges and skills needed for the Track Monitor position and the other covering the basic knowledges and skills needed for the Intercept Director position, were prepared as source documents for the training programs. (Author)

AD-260 316 Div. 23, 30
(31 July 61) OTS price $8.10

American Inst. for Research, Pittsburgh, Pa.
PRINCIPLES OF PROGRAMMING AS APPLIED TO THE DEVELOPMENT OF TWO SELF-INSTRUCTIONAL PROGRAMS FOR SAGE OPERATORS,
by Harris H. Shettel and Arthur A. Lumsdaine. Feb 61, 82p. incl. tables, 24 refs. (Rept. no. AIR-C11-61-SR-247)
(Contract AF 19(604)5951)
(AFCCDD TN 61-27) Unclassified report

DESCRIPTORS: *Programming, *Training, *Radar operators, Ground controlled interception systems, *Training devices, Teaching machines, Simulation, Effectiveness, Test methods.

The essential characteristics of the Track Monitor and Intercept Director tasks, for which self-instructional programs were developed, are described in behavioral terms. These characteristics were identified as including the following kinds of behaviors and skills: job knowledge (academic), decision-making, problem-solving, perceptual, positional-motor, symbol identification, and sequential. Emphasis is placed on these task characteristics only in so far as they had implications for the programming methodology used. The rationale developed for relating this programming methodology to the identified task characteristics is discussed in detail in terms of the following specific programming variables: form of response, type of feedback, method of cueing, size of step, organization of frames, and branching. Selected frames from the Track Monitor and Intercept Director programs are shown and discussed as examples of the application of each of these variables to various task characteristics. In addition, the organizational structure, the distribution of written (and other) responses, and the use of branching sequences is discussed for each program. (Author)

AD-260 317 Div. 23, 30
(31 July 61) OTS price $5.60

American Inst. for Research, Pittsburgh, Pa.
HANDBOOK FOR THE PREPARATION OF SELF-INSTRUCTIONAL MATERIALS FOR SAGE OPERATORS,
by Harris H. Shettel, David Angell, and Arthur A. Lumsdaine. Apr 61, 59p. incl. illus. table.
(Rept. no. AIR-C11-61-SR-248)
(Contract AF 19(604)5951)
(AFCCDD TN 61-30) Unclassified report

DESCRIPTORS: *Handbooks, *Programming, *Training, *Radar operators, Ground controlled interception systems, Training devices, Teaching machines, Simulation.

This handbook is designed to provide sneaifa3 nontechnical guidance to those persons who want to know more about the procedures and techniques generally recognized as important in the development of self-instructional materials and programs. Emphasis is placed on program development rather than on equipment (teaching machines). Following a general discussion of the self-instructional concept and the ways in which it differs from the more traditional forms of training are specific discussions of the various steps which should be followed in preparing self-instructional materials. Included are sections on: (1) Statement of program objectives, (2) Analysis of the /ask, (3) The organization of materials, (4) The techniques used in frame development (i.e., size of frame, selection of responses, use of cues, use of feedback, use of review and repetition, sequencing of frames), (5) Editing and tryout of program materials, and (6) Program revision and up-dating. Also included are discussions of the use of simulated job-operator equipment as an integral part of the self-instructional program and the implications that program presentation methods (devices) have on programming techniques. (Author)

AD-260 318 Div. 23, 30, 6
(31 July 61) OTS price $5.60

American Inst. for Research, Pittsburgh, Pa.
CHARACTERISTICS OF SELF-INSTRUCTIONAL DEVICES TO MEET TRAINING REQUIREMENTS FOR THE SAGE TRACK MONITOR, INTERCEPT DIRECTOR, AND RELATED SYSTEM-OPERATOR POSITIONS.
by Harris H. Shettel and Arthur A. Lumsdaine. Mar 61, 50p. incl. illus. (Rept. no. AIR-C11-61-SR-249)
(Contract AF 19(604)5951)
(ESD TN 61-47) Unclassified report

DESCRIPTORS: *Training devices, *Training, Radar operators, *Teaching machines, Tests, Programming, Simulation, Radar tracking, Ground controlled interception systems.

A statement of functional equipment requirements found to be congruent with the SAGE Track Monitor and Intercept Director self-instructional programs is presented. Self-instructional device components are described and evaluated in terms of these requirements. In the field testing of the programs the basic device was, with a few noted exceptions, found to meet most of the essential requirements. An alternative component was also used in the field tests and is briefly described. The basic device configuration used included console mock-ups, prepared as integral parts of the two self-instructional programs. They provided simulation of all essential button and switch insertion actions, and also simulated the flashing Situation Information Display on which is presented the various symbols and data which form an essential part of both the Track Monitor and Intercept Director tasks. A general discussion of the roles that devices can play in the implementation of on-the-site training, including the free time, unmonitored game-type self-training devices, as well as the more structured training emphasized in the present programs, is related to the specific approach taken in the development of the two devices used in this study. (Author)

AD-260 319 Div. 23, 30
(31 July 61) OTS price $2.60

American Inst. for Research, Pittsburgh, Pa.
SELF-INSTRUCTIONAL PROGRAMS FOR SAGE SYSTEM OPERATORS. THE DEVELOPMENT, USE, AND EVALUATION OF TWO PROTOTYPE SELF-INSTRUCTIONAL PROGRAMS COVERING BASIC JOB KNOWLEDGE FOR SAGE TRACK MONITOR AND INTERCEPT DIRECTOR OPERATOR POSITIONS. Final rept.,
by Harris H. Shettel, David Angell, and Arthur A. Lumsdaine. Apr 61, 23p. incl. illus. (Rept. no. AIR-C11-61-FR-252)
(Contract AF 19(604)5951)
(ESD TR 61-17) Unclassified report

DESCRIPTORS: *Training devices, Training, Radar operators, Teaching machines, Tests, Programming, Simulation, Radar tracking, Ground controlled interception systems.

The primary aim was to develop and evaluate self-instructional techniques and materials as applied to the training of basic job knowledges and skills for command and control operator tasks, represented by the SAGE Track Monitor and Intercept Director positions. Initial efforts concentrated on the development of two source documents covering all relevant basic knowledges and skills needed for each position based upon a review of the existing literature, observation of the tasks, and extensive interviews with operational personnel. These documents were subsequently utilized as the primary source of basic job knowledge for the two self-instructional programs. Programming techniques applied to the two SAGE programs included overt constructed (written) responses (about 45%), selective and pointing responses (about 45%), and covert (mental) responses (about 10%). The results obtained in the application of programs and devices support the feasibility of training complex tasks found in SAGE and other L-systems by means of self-instructional techniques. Also supported by this work is the use of a variety of programming techniques in a single large scale program. (Author)

AD-260 320 Div. 23
(31 July 61) OTS price $2.60

American Inst. for Research, Pittsburgh, Pa.
AN EXPERIMENTAL COMPARISON OF TWO TYPES OF SELF-INSTRUCTIONAL PROGRAMS FOR A SAGE SYSTEM PAIRED-ASSOCIATE TASK,
by Harris H. Shettel and Richard H. Lindley. Mar 61, 21p. incl. tables (Rept. no. AIR-C11-61-TR-251)
(Contract AF 19(604)5951)
(AFCCDD TN 61-20) Unclassified report

DESCRIPTORS: Programming, *Training, *Training devices, Personnel, Job analysis, Time, Test methods, Education, Design, Achievement tests, Vocational tests, Aptitude tests, Learning, Radar operators.

A problem in implementing self-instructional methodology for the training of SAGE and other

L-system operators is the wide variety of behaviors and skills required by these operators and the wide variety of training techniques available to the self-instructional programmer for teaching these skills and behaviors. The study was done to determine optimal presentation methods for teaching the phonetic alphabet which is characteristic of much of the symbolic material which forms a part of L-system operator tasks. This discrete-item, paired-associate material was prepared in six different formats: (1) long continuous-discourse program, overt responses; (2) short continuous-discourse program, overt responses; (3) same program as (2) but using covert responses; (4) flash cards, time limited, covert responses; (5) flash cards, time unlimited, covert responses; and (6) flash cards, time limited, with drop-out of mastered items. The least number of errors on two immediate post-tests were made by the subjects who were given the long program and any of the flash card programs. The most errors were made by subjects receiving either short program. (Author)

AD-260 321 Div. 23, 30, 6
(31 July 61) OTS price $6.60

American Inst. for Research, Pittsburgh, Pa.
EVALUATION OF TWO PROTOTYPE SELF-INSTRUCTIONAL PROGRAMS COVERING BASIC JOB KNOWLEDGE FOR SAGE TRACK MONITOR AND INTERCEPT DIRECTOR OPERATOR POSITIONS,
by Harris H. Shettel. Mar 61, 62p. incl. illus. tables (Rept. no. AIR-C11-61-SR-250)
(Contract AF 19(604)5951)
(ESD TN 61-51) Unclassified report

DESCRIPTORS: *Teaching machines, *Training, *Training devices, Tests, Programming, Test equipment, Radar operators, Simulation, Radar tracking, Ground controlled interception systems.

The Track Monitor (TM) and Intercept Director (IND) self-instructional programs and materials, covering basic job knowledges and skills, are investigated. Three groups of trainees completed each program: (1) naive trainees who had no SAGE experience at all; (2) cross-trainees who were proficient in other areas of SAGE but who had no TM or IND experience; and (3) new trainees who had received TM or IND training but had very limited experience on the job. A fourth group of experienced TM and IND personnel were given the proficiency tests but did not participate in the training programs. All training groups averaged 83% on the proficiency tests. Training time averaged 15 hours for the TM program and 19 hours for the IND program. Experienced personnel scored an average of five percentage points lower on the proficiency tests than the new and cross-training groups in both programs; they averaged five percentage points higher than the naive training groups for both programs. These results support the feasibility of using self-instructional materials of the type described for on-the-site initial training, cross-training, and transition training purposes. (Author)

AD-260 551 Div. 23, 28
(1 Aug 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
PREDICTING VOLUNTARY WITHDRAWAL FROM FLIGHT TRAINING BY MEANS OF A FORCED-CHOICE SCALE: CONSTRUCTION AND PRELIMINARY VALIDATION,
by Lawrence K. Waters and Robert J. Wherry, Jr. 18 May 61, 7p. incl. tables (Special rept. no. 61-2)
Unclassified report

DESCRIPTORS: *Training, Flight, Adjustment (Psychology), *Naval aviation, *Aviation personnel, Aptitude tests, Personality tests, Tests, Mathematical predictions, Effectiveness, Selection.

An experimental forced-choice scale was constructed for the purpose of predicting voluntary attritions from the Naval Air Training Program and was tested on a sample of entering students. The scale scores had a higher relationship to this type of attrition than did the scores of any of the current selection instruments. A combination of scale scores yielded a bi-serial correlation of 0.52 against a completion-voluntary attrition criterion. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-260 050 Div. 24
(2 Aug 61) OTS price $1.10

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TECHNIQUE FOR ANIMATION OF FILM STRIPS OF A 25-IMAGE FRAMING CAMERA,
by A. J. Kreiss and V. M. Boyle. May 61, 13p. incl. illus. (BRL technical note no. 1410)
Unclassified report

DESCRIPTORS: *High speed photography, *High speed cameras, *Rotating mirror cameras, Motion picture cameras, Detonation waves, Shock waves, Film projectors, Tests, Explosives.

In the study of detonation phenomena and other rapid events, special high speed cameras are necessary to photograph processes that occur in times of the order of microseconds. Running at high speed, a framing camera photographs a series of 25 consecutive pictures at an exposure time of 0.2 microsec. per frame and a frame interval of 0.8 microsec. The 25 exposures are thus completed in 20 microseconds. The frame size and position of each exposure on the 40-in. strip of 35mm film are such that the film is not suitable for projection in any standard equipment. A system is described for animating a series of high speed frames, and projecting the result as a motion picture with a time magnification of about 200,000 thereby allowing a viewer to grasp more readily time and space relationships of the high speed event under study. (Author)

AD-260 223 Div. 24
(27 July) OTS price $12.00

Chicago Aerial Industries, Inc., Barrington, Ill.
INVESTIGATION OF OPTIMUM FORMAT SIZES FOR AERIAL PHOTOGRAPHY.
Final rept.
June 61, 160p. incl. illus. tables (Rept. no. 2494-4)
(Contract DA 36-039-sc-78192)
Unclassified report

DESCRIPTORS: *Aerial photography, *Aerial photographs, Aerial cameras, Flight testing, Photographic film, Photographic analysis, Terrain, Stability, Roll, Pitch, Jet planes, *Aerial reconnaissance, Tables, Yaw.

Factors are discussed which affect photographic resolution as a function of format size for the same angular coverage on the ground. Static and flight tests were conducted with a 12-inch focal length K-17C camera, 6-inch focal length KA-30 camera, and a 3-inch focal length X-70-4 camera. The flight tests were conducted with all three cameras mounted vertically in a common mount installed in a U. S. Navy F9F-8P aircraft. All three cameras were exposed simultaneously. Two rate gyros provided camera roll and pitch rate information. The airborne resolution, both angular and linear is related to the static resolution and a comparison of the performance of the three cameras is made for flights over high contrast resolution targets. Also presented for the three format sizes is information per frame, information per unit weight and information per unit volume of each camera. (Author)

Division 25 - PHYSICS

25. PHYSICS

AD-260 007 Div. 25
(21 July 61) OTS price $6.60

Institute of Mathematical Sciences, New York U., N. Y.
QUANTUM STATISTICS AND THE BOLTZMANN EQUATION,
by Robert M. Lewis. June 61, 57p. (Research rept. no. MT-8)
(Contract AF 49(638)341, Proj. 47501)
(AFOSR-746) Unclassified report

DESCRIPTORS: *Quantum statistics, Operators (Mathematics), Series, Transformation (Mathematics), Quantum mechanics, Integration, Integral equations, Scattering, Equations, Differential equations, Density, Functional analysis, Special functions.

The system of hierarchy equations for the reduced density operators of quantum statistical mechanics is replaced by a single functional differential equation for a generating functional. A formal solution of the initial value problem for the latter equation is obtained, leading to series expansions of the reduced density operators. These expansions are used to obtain an improved derivation of the quantum-mechanical Boltzmann equation. (Author)

AD-260 009 Div. 25, 17
(21 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL DETERMINATION OF POTASSIUM VAPOR PRESSURE IN THE 550 TO 1,280 DEGREE C TEMPERATURE RANGE,
by N. S Grachev and P. L. Kirilov. July 61, 7p. incl. illus. (Technical trans. no. F-66 of Inzhenerno-Fizicheskiy Zhurnal 3:62-65, June 60)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical translation F-66.

DESCRIPTORS: *Potassium, Sodium, *Vapor pressure, High temperature research, Heat transfer, Tests, USSR, Technological intelligence, *Potassium alloys, *Liquid metals.

An attempt was made to verify published data from experiments by Makansi, (Journ. Phys. Chem., 60:128, 1956)., and to broaden the previously investigated temperature interval. The potassium melting point was found to agree with other published data, but experiments yielded lower values for sodium and potassium vapor pressure than did those of Makansi. (Author)

AD-260 010 Div. 25
(21 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
POWER INPUT TO A SMALL FLAT PLATE FROM A DIFFUSELY RADIATING SPHERE, WITH APPLICATION TO EARTH SATELLITES,
by F. G. Cunningham. July 61, 13p. incl. illus. (NASA Technical note D-710)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-710.

DESCRIPTORS: *Astrophysics, Geophysics, Absorption, *Blackbody radiation, *Thermal radiation, Earth, Spheres, Satellite vehicles, Integral equations, Sheets, Integrals, Disks, Partial differential equations.

A general derivation is given for the radiation incident on a small flat plate from a uniformly radiating sphere. The results are presented as a function of the separation of the bodies and the orientation of the plate. The derived equations permit a determination of the total power input to a plate, whose absorptivity is to be defined, from a radiating sphere whose surface properties are to be defined. In addition, a series of curves is given which represents the power input from earth radiation to one side of a flat plate for various orientations of the plate, for a range of altitudes from 200 km to 32,000 km above the earth. These curves are based upon the assumption that the earth is a uniform diffuse emitter radiating as a black body at a temperature of 250 K. The instantaneous earth-emitted radiation incident on the elements of the surface of any satellite can be determined with these curves. (Author)

AD-260 024 Div. 25
(25 July 61) OTS price $6.60

Illinois U., Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART I. THEORETICAL AND EXPERIMENTAL ANALYSIS OF CIRCULAR CROSS-SECTION TORSION-TENSION MEMBERS MADE OF MATERIALS THAT CREEP.
Rept. for 1 Nov 59-31 Oct 60 on Metallic Materials,
by S. Dharmarajan and O. M. Sidebottom. Jan 61, 64p. incl. illus. table, 32 refs.
(Contract AF 33(616)5658, Proj. 7351)
(WADD TR 60-580, pt. 1) Unclassified report

DESCRIPTORS: Mechanics, *Cylindrical bodies, Deformation, Plasticity, Theory, Design, Stresses, Torque, Mathematical analysis, Materials, Creep, Nylon, Steel, Ethylenes, Polymers, Load distribution, Beams, Tests.

A new approach is presented to the problem of multiaxial creep. The theory is based on the usual assumptions; namely, the directions of the principal stresses and strains coincide, the Hencky-Mises flow condition is valid, and the material is incompressible. It is proposed that load-deformation relations be derived for a specified time so that the theory is independent of time. For uniaxial state of stress the flow condition was assumed to be the isochronous stress-strain diagram obtained from constant stress, tension and compression creep curves. The torsion-tension member was chosen to represent the multiaxial states of stress. Sokolovsky's compressible solution was compared with a closed solution based on the assumption of incompressibility. Experimental data were obtained from nylon and polyethylene members tested in a controlled environment room and 17-7PH stainless steel members at 972F. Good agreement was found between theory and experiment. (Author)

AD-260 029 Div. 25
(24 July 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF PARTLY WRINKLED MEMBRANES,

by Manuel Stein and John M. Hedgepeth. July 61, 32p. incl. illus. (NASA Technical note D-813)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-813.

DESCRIPTORS: Mechanics, *Membranes, Structures, Stresses, Deformation, Theory, Mathematical analysis, Sheets, Cylindrical bodies, Disks, Torque, Load distribution.

Lightweight structures having stretched-membrane components have many potential applications in space. Under some loadings wrinkling will occur over part of the membrane. In order to utilize membrane structural components efficiently, the designer must know the properties of such components in the range of loading from the onset of wrinkling to final collapse as well as in the range in which the membrane is unwrinkled. A theory is derived to predict the stresses and average deformations for loads under which part of the membrane wrinkles. Specific solutions of problems in flat and curved membranes are presented which show that membrane structures retain much of their stiffness at substantially higher loads than the load corresponding to the onset of wrinkling. (Author)

AD-260 030 Div. 25
(24 July 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
RESULTS FROM A ROCKET-BORNE LANGMUIR PROBE EXPERIMENT,
by Gideon P. Serbu. July 61, 9p. incl. illus. (NASA Technical note D-570)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-570.

DESCRIPTORS: *Sounding rockets, *Ionosphere, Plasma physics, Electrons, Ions, Electrometers, Temperature.

Data were obtained from a rocket-borne Langmuir probe experiment up to an altitude of 220 kilometers above Fort Churchhill, Canada, in a quiet daytime ionosphere. The electron temperatures deduced from the probe data are in good agreement with the accepted neutral gas temperatures at altitudes above 140 km. Improper corrections for the positive ion component of the diffusion current to the rocket, which component is adversely affected by the high rocket velocity, are thought to be the cause for the much higher electron temperatures measured below 140 km. The rocket-to-plasma potential was measured as 1/2 to 1 volt negative. (Author)

AD-260 049 Div. 25
(25 July 61) OTS price $8.10

Polytechnic Inst. of Brooklyn, N. Y.
STRESS AND DISPLACEMENT ANALYSIS OF A CLAMPED NONCIRCULAR CYLINDRICAL SHELL UNDER HYDROSTATIC PRESSURE,
by William P. Vafakos, Frank Romano and Joseph Kempner. June 61, 87p. incl. illus. tables, 15 refs. (PIBAL rept. no. 594)
(Contract Nonr-83914, Proj. NR 064-167)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, Structural shells, Hydrostatic pressure, *Stresses, *Deformation, Mathematical analysis, Equations, Elasticity, Mechanics, Theory.

Deflections and stresses are analyzed for a noncircular cylindrical shell of uniform wall thickness under hydrostatic load and with its edges clamped in such a fashion that the end sections remain plane and normal to the axis. By assuming a Fourier series in the closed circumferential direction and using the principle of the minimum of the total potential, the partial differential equations of equilibrium are replaced by a set of ordinary differential equations. The displacements obtained by solving these equations are used to obtain the stresses. The results are then compared with those obtained by 2 simple approximate solutions for circular cylindrical shells. Numerical results are obtained for an oval shell with a circumference-to-wall thickness ratio of 576, a circumference-to-axial length ratio of 24, and a major-to-minor axis ratio of 1.10. The maximum radial displacement occurs at points on the shell determined by the intersection of the midlength cross section with the generators representing the loci of least curvature. The maximum stress is an axial stress due principally to bending, and occurs at those points of the clamped edges having the least curvature.

AD-260 061 Div. 25, 4
(20 July 61) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
COMPUTATIONS FOR THE EXCLUDED VOLUME PROBLEM IN CONNECTION WITH THE CONFORMATION OF POLYMER MOLECULES,
by Michael P. O'Flaherty. 3 July 61, 38p. incl. tables (Technical rept. no. 11)
(Contract Nonr-22537, Proj. NR-044-211)
Unclassified report

DESCRIPTORS: *Molecules, *Polymers, *Lattices, *Molecular structure, Helixes, Numerical methods and procedures, Digital computers, Tables, Probability, Viscosity, Polymer solutions.

A 7090 IBM digital computer program was developed to verify certain results and contribute to the excluded volume problem. The distribution of the mean square length of all possible walks of n steps was computed for walks of up to and including sixteen steps in the two dimensional, 90 degrees, three-choice lattice. The values of u sub n, non-intersecting closed walks of n steps, were also computed and the computed values of non-intersecting walks of n steps and u sub n agree perfectly with the values given by Fisher and Sykes (Phys. Rev. 14:45-48,1959). (Author)

AD-260 075 Div. 25, 8
(24 July 61) OTS price $10.50

Antenna Lab., Ohio State U. Research Foundation, Columbus.
SOME CALCULATIONS OF THE PHASE SHIFT AND ATTENUATION RATES OF THE HYPERSONIC PLASMA SHEATH.
Rept. on Ion Sheath Research,
by R. J. Plugge, S. Chen, and R. K. Long.
31 Jan 61, 125p. incl. illus. (Rept. no. 1021-3)
(Contract AF 33(616)6782)
Unclassified report

DESCRIPTORS: *Plasma physics, Hypervelocity vehicles, *Electromagnetic properties, Conductivity, Absorption, Attenuation, Reflection, *Magnetohydrodynamics, Electromagnetic waves, Refractive index.

Electromagnetic parameters (relative permittivity, relative conductivity, ordinary index of refraction, extinction or absorption coefficient, attenuation rate, phase coefficient, reflection coefficient for the electric field) of the plasma sheath surrounding hypersonic vehicles are evaluated for plane-wave propagation using small signal macroscopic approximations. The parameters are computed at typical telemetering frequencies from 250 mc to 30,000 mc. The results are plotted as functions of the altitude and speed of the vehicle. Parameters for longitudinal propagation of transverse electromagnetic waves in a magneto-plasma are also computed. (Author)

AD-260 083 Div. 25
(25 July 61) OTS price $1.10

King's Coll., U. of London (Gt. Brit.).
GEOMETRICAL AND PHYSICAL INTERPRETATION OF THE WEYL CONFORMAL CURVATURE TENSOR,
by F. A. E. Pirani and A. Schild. 1 May 61, 8p. incl. illus. (Technical note no. 2)
(Contract AF 61(052)457; In cooperation with Texas U., Austin and Institute for Advanced Studies, Dublin (Eire))
(ARL-98) Unclassified report

DESCRIPTORS: *Relativity theory, Tensor analysis, Conformal mapping, Vector analysis, Geodesics, Diffraction, Electromagnetic fields, Algebraic topology, Light.

The Weyl (conformal curvature) tensor of spacetime is interpreted geometrically in terms of the behaviour of congruences of null geodesics. The corresponding physical interpretation provides, in principle, a means for the measurement of physical components of the Weyl tensor with light rays alone, without the use of clocks or rigid rods. (Author)

AD-260 088 Div. 25, 8
(27 July 61) OTS price $8.60

Microwave Lab., Stanford U., Calif.
PLASMA SHEATH FORMATION BY RF FIELDS,
by Harold Sims Butler. Apr 61, 92p. incl. illus. tables (ML rept. no. 820)
(Contract AF 49(638)415, Proj. 47501)
(AFOSR-673) Unclassified report

DESCRIPTORS: *Plasma physics, Gas discharges, Magnetic pinch, Magnetohydrodynamics, *Electromagnetic effects, Radio waves, Gas ionization, *Ionic current.

It has been observed experimentally that the application of a radiofrequency voltage (20 kc/s - 30 Mc/s) to any one of several electrode configurations around the outside of a plasma discharge tube results in a constriction of the light-emitting portion of the plasma away from the inner walls of the glass tube. This phenomenon was initially thought to be the result of the rf confinement mechanism proposed by Weibel and by Boots, et. al. However, our investigation has established that the phenomenon is not rf confinement but rather the result of an interaction between the externally applied rf voltage and the plasma which leads to the formation of a dc positive ion sheath. Four experimental measurements together with a description of the equipment utilized in obtaining them are presented which define the general characteristics of the interaction. (Author)

AD-260 089 Div. 25
(25 July 61) OTS price $1.10

Syracuse U. Research Inst., N. Y.
QUANTIZATION OF GENERALLY COVARIANT FIELD THEORIES.
Final rept., 1 Mar 57-31 Dec 60,
by Peter G. Bergmann. May 61, 3p.
(Contract AF 33(616)5069, Proj. 7114)
(ARL-18) Unclassified report

DESCRIPTORS: *Relativity theory, *Electromagnetic fields, *Gravity,* Energy, Research program administration, Analysis of variance.

Work concerned with relativity and pure gravitational theory is summarized. The total number of research papers published is seven. The subjects covered were the energy flux of gravitational waves, the construction of observables, the commutation relation between observables, and null electromagnetic fields. This work is being continued under a new contract AF 33(616)6867. (Author)

AD-260 090 Div. 25
(25 July 61) OTS price $1.10

Pittsburgh U., Pa.
RESEARCH DIRECTED TOWARD THE QUANTIZATION OF THE GRAVITATIONAL FIELD.
Technical rept. on Gravitational and Electromagnetic Field Physics,
by A. Janis and E. Newman. May 61, 4p.
(Contract AF 33(616)5540, Proj. 7114)
(ARL-19) Unclassified report

DESCRIPTORS: *Relativity theory, Gravity, Energy, Differential equations, Algebraic topology, *Research program administration.

Research on the quantization of the general theory of relativity is summarized. The work is divided into four principal categories: (1) the measurement of distance in general relativity; (2) The definition of rigid frames in relativity; (3) The theory of gravitational radiation; and (4) The nature of the observables of general relativity. (Author)

AD-260 113 Div. 25, 8, 12
(24 July 61) OTS price $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A BRIEF INVESTIGATION OF THE EFFECT OF AN IONIZED LAYER AROUND A VEHICLE OF THE TRANSMISSION OF MICROWAVE SIGNALS.

Rept. on Ion Sheath Research,
by Sinclair Chen. 15 Apr 61, 10p. incl. illus. tables (Rept. no. 1021-4)
(Contract AF 33(616)6782, Proj. nos. 1630-4427 and 1670-4062)
Unclassified report

DESCRIPTORS: *Plasma physics, *Re-entry vehicles, Extremely high frequency, *Microwaves, *Radio transmission, Radio signals, Hypervelocity vehicles, Antenna radiation patterns, Guided missile noses, Wave transmission, Mathematical analysis, Electrical properties, Gas ionization, Blunt bodies, Boundary layer, Bodies of revolution, Conical bodies, Guided missiles, Surface to surface, Satellite vehicles.

An approximate analysis of the power transmission coefficient of an ionized layer surrounding a spherically blunted nose cone type vehicle was performed for three frequencies (30, 33, and 36 kmc). The analysis was done by using the best available aerodynamic data at various stations of the vehicle. It was found that other than in the stagnation region, better than approximately 89% of the incident power in the case of normal incidence can be transmitted through the layer; and, in general, the higher the signal frequency for the frequency range under investigation, the higher the transmission. The effect of the ionized layer on the antenna field pattern can be predicted by using Lorentz reciprocity relationship. The beam tilt of an antenna pattern caused by the presence of the ionized layer was computed for the case of an ideally narrow pencil type beam. Again, using the best available aerodynamic data, a beam tilt of less than 0.6 degrees can be expected for the signal frequencies within the range of 30 to 36 kmc. (Author)

AD-260 119 Div. 25, 8
(24 July 61) OTS price $1.10

Tufts U., Medford, Mass.
DIELECTRIC DISPERSION IN CONDENSED PHASES OF MOLECULES EXHIBITING INTERNAL ROTATION.
Quarterly status rept. no. 1, 15 Apr-15 July 61,
by Karl H. Illinger. 15 July 61, 2p.
(Contract Nonr-49419)
Unclassified report

DESCRIPTORS: *Dielectrics, Dielectric properties, *Liquids, *Solids, Microwaves, Wave transmission, Reflectometers, *Microwave equipment, Microwave oscillators, *Microwave spectroscopy, Measurement, Molecules, Solid state physics, Backward-wave oscillators.

An apparatus was designed and is in the process of assembly for the measurement of transmission and reflection spectra of liquids and solutions in the frequency interval between 8.2 and 12.4 kmc. Attenuation and the reflection coefficient are measured as a continuous function of frequency and will permit calculation of the imaginary and the real parts, respectively, of the complex dielectric constant. A Varian VA-161 backward-wave oscillator, coupled to the waveguide system with a broad-band ferrite isolator, provides a continuous source of frequencies between 8.2 and 12.4 kmc. A microwave reflectometer, employing 2 multi-hole directional couplers, comprises the basic circuit for the continuous frequency measurement of the reflection coefficient.

AD-260 164 Div. 25
(26 July 61) OTS price $1.60

General Technology Corp., Elgin, Ill.
AN ELASTIC-PLASTIC ANALYSIS OF A THIN-WALLED CIRCULAR CYLINDER UNDER AXIALLY SYMMETRIC LOADING.
Rept. on Research and Development Study on Stress-Strain Characteristics of Shells and High Explosives,
by A. L. Jones, A. C. Eringen and M. M. Stanisic. May 61, 18p. incl. illus. (Technical rept. no. 1-16)
(Contract DA 11-022-501-ORD-2907)
Unclassified report

DESCRIPTORS: Mechanics, *Cylindrical bodies, Structural shells, Elasticity, Plasticity, Deformation, Stresses, Theory, Mathematical analysis, Deflection, Load distribution.

An analysis is presented of the deformation of a thin-walled circular cylinder under axially symmetric loading. The yield criteria of Mises and Tresca are both applied to the case where the load is greater than an amount which will cause yielding in a section of the wall, i.e., a section of the wall is in a plastic state while the rest is in an elastic state.

AD-260 176 Div. 25, 31, 1, 12, 30
(26 July 61) OTS price $.75

Naval Research Lab., Washington, D. C.
PROCEDURES FOR THE EVALUATION OF FRACTURE TOUGHNESS OF PRESSURE-VESSEL MATERIALS,
by W. S. Pellini and J. E. Srawley. 8 June 61, 26p. incl. illus. 24 refs. (NRL rept. no. 5609)
Unclassified report

DESCRIPTORS: *Pressure vessels, *Fracture (Mechanics), Materials, Design, Test methods, Submarine hulls, Airframes, Mechanics, Metal plates, Sheets, Tests.

Normal design procedures for internally and externally pressurized pressure vessels are based on the criteria of failure by general yielding or instability. Such procedures are valid if the fracture toughness of the material, as fabricated, is sufficient to prevent failure by a fracture mode. The degree of fracture toughness that is required is known to vary with the design, service conditions, and method of fabrication. Because of the complexity of the interactions of these factors, the specific fracture-toughness requirement is ordinarily determined by the testing of models and of full-scale vessels, with correlation to laboratory fracture tests. Charpy V tests have provided effective laboratory-specimen correlations for steels of low and intermediate strength levels. For materials of higher yieldstrength-to-density ratios, it appears that the level of toughness associated with full shearing decreases; this may prove to be a limiting factor. Thin high-strength materials for airframes and rockets are evaluated, by direct determination of the effect of cracks on fracture stress - a tiny crack in a very-high-strength material can induce fracture at a fraction of the yield strength. Stress-analysis methods are employed to derive values of a characteristic fracture-toughness property through which, ideally, fracture stress may be related to flaw size. (Author)

Division 25 - PHYSICS

AD-260 183 Div. 25, 26
(26 July 61) OTS price $1.60

Spectroscopy Lab., Mass. Inst. of Tech., Cambridge.
RULING OF LARGE DIFFRACTION GRATINGS UNDER INTERFEROMETRIC CONTROL.
Final rept.,
by George R. Harrison. 30 June 61, 9p.
(Contract AF 19(604)1965)
(AFCRL-670) Unclassified report

DESCRIPTORS: *Diffraction gratings, Production, Manufacturing methods, Spectrographic analysis, *Interferometers, Machines, Machining, Optical equipment, Optics laboratory, Light, Ultraviolet radiation.

Increase in the quality and availability of diffraction gratings is discussed, and new techniques which would make possible the production of gratings having higher resolving power, dispersion, speed, and usefulness than those previously available are treated. The gratings described have been designed principally for use in the visible and ultraviolet regions of the spectrum, although important applications in the infrared and far ultraviolet are expected. Plane gratings up to 10-inches in width, with resolution much higher than any previously available, were ruled only weak satellite and ghost defects. A number of master gratings have been produced from which replicas have been produced commercially, and the demand for gratings from M.I.T. ruled masters now far exceeds the supply. (Author)

AD-260 199 Div. 25, 15
(26 July 61) OTS price $1.60

Uppsala U. (Sweden).
TRANSFORMATION OF OBSERVED PROJECTED INTENSITIES INTO RADIAL DISTRIBUTION OF THE EMISSION OF A PLASMA,
by Kjell Bockasten. 4 July 60, 8p. incl. illus. tables (Technical note no. 3)
(Contract AF 61(052)170)
(ARL-88) Unclassified report

DESCRIPTORS: *Plasma physics, Astrophysics, Numerical methods and procedures, Photons, Transformations (Mathematics).

A new method for transforming observed projected intensities into the radial distribution of the emission is described. It is applicable to optically thin plasmas with cylindrical or spherical symmetry, which are often encountered in plasma physics and astrophysics. The observations are introduced as a sequence of n readings on the experimental curve, which are then transformed to a set of values for the emission coefficient. The transformation coefficients are tabulated for n = 10, n = 20, and, in part, for n = 40. The method is more accurate and more direct than previously published ones and is well suited for rapid calculating by electronic computers. The sources of errors are discussed and a numerical method for smoothing the readings is suggested. (Author)

AD-260 205 Div. 25, 15
(26 July 61) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
ANTIPLANE ELASTIC SYSTEMS. VII. GENERAL LINEAR AND CYLINDRICAL ANISOTROPHY,
by L. M. Milne-Thomson. May 61, 46p. (MRC technical summary rept. no. 231)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Stresses, Structures, Deformation, Beams, Load distrubution, Integral equations, *Elasticity, Mathematical analysis, *Tensor analysis.

Contents:
Boundary conditions for the complex stresses
The form of the complex stresses at infinity
Generalized plane deformation
Complex stresses for generalized plane deformation
Line force applied to an elastic half-plane
Induced mappings for region exterior to an ellipse
Elliptic cylindrical hole in infinite elastic space
Determination of the complex stresses
Elliptic hole under hydrostatic pressure
Unloaded elliptic cylindrical hole in a space under stress
Bending of cantilever by force at free end
Center of flexure
Timoshenko's stress function
Flexure with elliptic or circular cross-section
Cylindrical anisotropy
The displacement in cylindrical anisotropy
Lateral and end conditions
Equations satisfied by the stress functions
Circular tube under pressure
Determination of the stresses
Lame's problem of the tube under pressure

AD-260 208 Div. 25
(26 July 61) OTS price $3.60

Watertown Arsenal Labs., Mass.
ON THE BASIC THEORY OF THIN CYLINDRICAL SHELLS.
Rept. on Research of Materials for Lightweight Construction,
by Oscar L. Bowie. June 61, 32p. incl. illus. tables (Rept. no. WAL TR 893.3/3 rev.; Supersedes AD-244 299)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Structural shells, Stresses, *Deformation, Elasticity, Theory, Mathematical analysis, Load distribution.

A three-dimensional solution for cylindrical shells is considered and sets of solutions satisfying the exact equilibrium equations are generated. A revision of the procedure for approximating the boundary conditions is presented. This procedure is based on an order of magnitude estimate of the generating displacement coefficients of the solution and leads to an effective scheme for determining the form of solution. Using this approach, the range of applicability of conventional thin shell theory can be extended to moderately thick cylinders. The solution is carried out numerically for the case of bending moments acting on the ends of the cylinder. (Author)

AD-260 248 Div. 25, 17, 14
(27 July 61) OTS price $2.25

Southwest Research Inst., San Antonio, Tex.
STUDIES OF TRANSIENT HEAT CONDUCTION AT HIGH THERMAL FLUX.
Rept. for 15 Mar 59-31 July 60 on The Chemistry and Physics of Materials,

by H. Norman Abramson, Wen-Hwa Chu, and John C. Cook. Jan 61, 78p. incl. illus. 24 refs.
(Contract AF 33(616)6323, Proj. 7360)
(WADD TR 60-608) Unclassified report

DESCRIPTORS: *Thermal conductivity, *Ablation, *Heat transfer, Copper, Plastics, Resins, Stainless steel, Graphite, Electric arcs, Pressure vessels, Vacuum apparatus, Thermal radiation, Test facilities, Test equipment, Calorimeters, Spectrographic analysis, Photographic analysis, Vapors, Surfaces, Rods, Theory, Heat resistant polymers.

Results of a theoretical and experimental study of transient heat conduction in cylindrical specimens of copper, Bakelite, stainless steel and graphite, subjected to an incident thermal flux of approximately 500 cal/sq cm-sec. Theoretical investigations included the solution of the transient heat flow equation for cylindrical rods of finite length and with temperature dependent thermophysical properties. Comparisons of this theory, and similar theoretical approaches by other investigators, with experimental results show a large and consistent difference for all materials investigated. The results obtained thus far indicate a serious inadequacy of present heat transfer theory for thermal fluxes of this order of magnitude, and the consistency of these results suggests that a considerably modified theory must be developed to achieve agreement with experiment. (Author)

AD-260 251 Div. 25, 30
(27 July 61) OTS price $7.60

Utah U., Salt Lake City.
EFFECTS OF EDGE MATERIAL ON WIDE ANGLE DIFFRACTION.
Master's thesis,
by Gordon R. Orme. June 61, 226p. incl. illus. 36 refs.
(Contract AF 49(638)799)
(AFOSR-822) Unclassified report

DESCRIPTORS: *Light, *Diffraction, *Optics, Measurement, Instrumentation, Photometers, Phototubes, Collimators, Monochromatic light, Optical equipment, Optics laboratories, Solids, Electronic circuits, Amplifiers.

Precision photometric traces of light diffracted 70 deg into the shadow region were made for four different diffracting edges. Two of the half planes were gold plated, one silver plated, and one copper plated. Light of wave-lengths 4358 A or 5461 A was normally incident on the edge for all cases. Intensity traces as a function of diffracting angle were made for light polarized perpendicularly and parallel to the edge for both wave-lengths. The distance from the edge to the photometer was 19.5 cm. The diffracted light was measured by a liquid-nitrogen-cooled 1P21 electron photomultiplier photometer. A new solid state amplifier system was used to lend high stability to the measurements taken. Although experimental conditions do not rigorously satisfy Sommerfeld's boundary conditions, comparison is made with Sommerfeld theory to show in general how the patterns for the different metals vary. The light intensity ranged over 10 to the 9th power part of that observed at the geometrical shadow. In general the traces agree to within an order of magnitude with Sommerfeld theory. The different metals and wavelengths exhibited a pronounced effect on the intensity distribution and polarization of the light diffracted into the shadow region. (Author)

AD-260 255 Div. 25, 4
(1 Aug 61) OTS price $1.60

Johns Hopkins U., Baltimore, Md.
IODINE NQR SPECTRUM OF BORON TRIIODIDE,
by W. G. Laurita and W. S. Koski. 1960, 10p.
(Contract AF 18(600)1526)
(AFOSR TN 59-191) Unclassified report

DESCRIPTORS: *Boron compounds, *Iodides, Halides, Bromides, Chlorides, *Chemical bonds, *Crystal structure, *Nuclear electric quadrupole moment, Nuclear spins, *Molecular spectroscopy, Hyperfine structure, Atomic energy levels, Atomic orbitals, Nuclear structure, Electron transitions, Quantum mechanics, Electrons, Atomic spectrum, Measurement, Iodine, Resonance.

Consideration was given to the experimental measurement of the quadrupole coupling constant (eQq sub zz in which e is the proton charge) and the asymmetry parameter (N) and their relation to the nature of the chemical binding in BI3. Comparison is also made with the corresponding parameters in the other boron trihalides.

AD-260 279 Div. 25, 17
(28 July 61) OTS price $7.60

Fritz Engineering Lab., Lehigh U., Bethlehem, Pa.
BEAM-COLUMN EXPERIMENTS.
Rept. on Welded Continuous Frames and Their Components,
by R. Carlton Van Kuren and Theodore V. Galambos. June 61, 67p. incl. illus. tables, 17 refs.
(Rept. no. 205A.30)
(Contract Nonr-61003)
Unclassified report

DESCRIPTORS: *Beams, *Steel, Deformation, Deflection, Stresses, Theory, Tests, Test equipment, Test methods, Design, Load distribution, Plasticity, Moments, Elasticity, Mechanical properties, Buckling.

The report contains a description of 42 beam-column experiments conducted to study the strength and deformation characteristics of as-rolled wide-flange columns subjected to axial force and bending moments about the strong axis. The effects of axial force, length, member size, lateral bracing, and loading conditions are studied. The scope of the tests, the test setup, and the experimental procedures are described. The effects of the variations of the various parameters are discussed. Finally, the results are compared with various theories and with empirical interaction curves. (Author)

AD-260 282 Div. 25
(28 July 61) OTS price $6.60

Navy Electronics Lab., San Diego, Calif.
NOVEL SOUND SOURCES.
Rept. for June 56-Sep 60,
by L. R. Padberg, Jr. 17 Oct 60, 63p. incl. illus. (NEL rept. no. 990)
Unclassified report

DESCRIPTORS: *Underwater sound generators, *Sound generators, Sparks, Pneumatic devices, Echo ranging, Underwater explosions, *Underwater sound, Low frequency, Bubbles.

Two different types of LF high-intensity sound sources have been developed which have both military and commercial potentialities: The underwater spark sound source is suitable for explo-

sive echo ranging, particularly from a submarine, and shows promise as a source for long-range, active detection and for long-range underwater signaling. This source has been tested at a depth of 300 feet below the surface and generated peak pressures corresponding to an acoustic level in excess of 3 million watts for a broadband nondirectional condition. In the 1000-4000-c/s frequency band, a corresponding acoustic level in excess of 300,000 watts was developed for a nondirectional condition. The pneumatic sound source, is probably the simplest generator of underwater sound yet discovered (in its lightest form it weighs less than 1 pound). This source has generated a peak acoustic level of over 4000 watts for a nondirectional condition, in the frequency range between 5 and 300 c/s. (Author)

AD-260 304 Div. 25, 5
(28 July 61) OTS price $1.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
ON THE RECOGNITION OF SIGNAL PATTERNS IN NOISE,
by Jack K. Wolf and John B. Thomas. May 61, 11p. 18 refs. (Proj. no. 4519; rept. no. RADC TN 61-83)
Unclassified report

DESCRIPTORS: *Noise (Radio), Statistical analysis, Mathematical analysis, Integral equations, *Optics, *Optical filters, *Communications theory, *Signal-to-noise ratio, Information theory, Mathematical prediction.

In the application of statistical decision theory to the recognition of two-dimensional patterns in noise, the decision as to which of a set of patterns is present involves the calculations of a likelihood function for each of the possible signals. In this paper, systems are developed for the calculation of these functions when the signal patterns are perturbed by multiplicative and additive noise. The resulting realizations are shown to reduce to two-dimensional matched filters. In the development, a useful orthogonal expansion of two-variable random processes is derived. (Author)

AD-260 308 Div. 25, 8, 30
(28 July 61) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
INFLUENCE OF SHOCK MACHINE LOADING ON SHOCK SPECTRA,
by H. N. Luhrs and H. R. Spence. May 61, 11p. incl. illus. tables (Rept. no. 7103-0018-NU-000)
(Contract AF 04(647)619)
(AFBMD TN 61-31) Unclassified report

DESCRIPTORS: *Shock, Shock resistance, *Impact shock, Sensitivity, Guided missiles, *Electronic equipment, Test equipment, Design, Vibrations, High frequency, Low frequency, Mathematical analysis, Handling, Test methods.

The influence of shock machine loading, by the test item, was investigated to determine whether any peaks or notches are introduced into the acceleration shock spectrum which would cause excessive over or under testing at various frequencies. The results showed that the shock spectrum for a terminal peak saw-tooth pulse is quite insensitive to shock machine loading. The very low frequency end (below 100 cps for a 6 millisecond pulse) is most influenced, whereas the higher frequencies are virtually not influenced at all. The results also showed that even for a very high loading condition the primary spectrum is in all cases less severe than the residual spectrum. Curves have been generated to depict both the primary and the residual spectrum for various resonators to shock platform mass ratios, for the case of a terminal peak saw-tooth pulse. (Author)

AD-260 323 Div. 25
(31 July 61) OTS price $1.60

AVCO Research Lab., Everett, Mass.
RADIATION FROM HOT NITROGEN,
by R. A. Allen, J. C. Camm, and J. C. Keck. Apr 61, 15p. incl. illus. table (Research rept. no. 102)
(Contracts AF 04(647)278 and DA-19-020-ORD-4862)
(AFBSD TR 61-2) Unclassified report

DESCRIPTORS: *Nitrogen, Thermal radiation, *High temperature research, Hypersonics, *Shock waves, Shock tubes, Dissociation, Oxygen, Air, Cyanides, Chemical impurities, Plasma physics, Reaction kinetics, Gas ionization, Molecular spectroscopy, Atomic spectrum, Spectrographic analysis, Test equipment.

The equilibrium radiation emitted by shock heated nitrogen has been studied in the wavelength range 3300 to 7100 angstroms at an equilibrium temperature from 6000 - 7000 K and densities 0.01 to 0.20 times atmospheric. Identification of the various radiating band systems was accomplished by spectroscopic techniques. The absolute intensity versus wavelength profile at thermodynamic equilibrium was obtained using photometric methods. By comparing this profile with theoretical predictions, the electronic f-number for the N2(+)(1-) system was found to be .09 + or - .05. CN and O2 contamination effects were also investigated. By studying the density dependence of the radiation, the collisional deactivation cross section for this band was found to be greater than 10 to the -15th power sq cm. (Author)

AD-260 330 Div. 25, 8
(31 July 61) OTS price $19.75

Battelle Institut, Frankfurt/Main (Germany).
THEORETICAL INVESTIGATIONS AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS. PART I. DESIGN STUDIES OF A MEASURING DEVICE IN PLASMA ELECTRONICS.
Final rept. 1 Dec 58-30 Apr 61,
by J. Eitzenberger, G. Biener and others.
31 May 61, 275p. incl. illus. tables.
(Contract DA 91-591-EUC-1018, Proj. OI-1165-59)
Unclassified report

DESCRIPTORS: *Plasma physics, Electromagnetic waves, Ionosphere, Measurement, Theory, *Cavity resonators, Phase measurement, Gas ionization, Electrons, Density, Magnetohydrodynamics.

In Part I the theoretical relationships between the propagation processes of electromagnetic waves in an ionized gas and its dielectric characteristics are discussed. Part II concerns work performed with a view to developing the plasma penetration unit. At first the different methods for the investigation of plasma by means of electromagnetic waves are shown and thereafter a detailed description of the measuring device with automatic frequency control developed by us will be given. Part III concerns the development of investigations into the cavity resonator method.

In the same way as our penetration device, the cavity resonator can be used to study periodic as well as single ionization and recombination processes in plasma. In Part IV the results of the measurements will be discussed which were performed on the two plasma measuring devices with a view to checking the suitability of the devices. (Author)

AD-260 331 Div. 25, 7, 17
(31 July 61) OTS price $3.60

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC POWER GENERATION AND RELATED PHENOMENA.
Bimonthly rept. no. 10, 7 July-7 Sep 60. 15 Nov 60, 30p. incl. illus. tables.
(Contract NObs-77034)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Semiconductors, Generators, Intermetallic compounds, Alloys, Gallium compounds, Arsenides, High temperature research, Aluminum compounds, Electrical properties, Measurement, Resistance, Hall effect, Temperature, Thermal diffusion, Thermal conductivity, Indium compounds, Antimonides, Zone melting, Lead compounds, Tellurides.

The solute build-up technique (crystallization from solution) was further evaluated. An ingot of GaAs was prepared to test the technique with newly developed equipment consisting of a 3-zone furnace arrangement. The main furnace provided for well-controlled, linear temperature gradients of the order of 5 to 10 degrees C/cm up to 1200 C. Results indicated that the technique is applicable for the preparation of sound, directionally grown ingots of intermetallics at temperatures far below their melting points and under conditions of relatively low activity of solute. Values of the energy gap were obtained optically for the pseudobinary system GaAs-AlAs from 0.0 to 45.0 mol-% AlAs. The value varied linearly with AlAs content. High-temperature measurement apparatus designed for the measurement of resistivity, Hall coefficient, and thermoelectric power was successfully operated up to 730 C. Measurements were completed of the thermal diffusivity of InSb up to 500 C using a back-surface-temperature method.

AD-260 334 Div. 25, 17
(31 July 61) OTS price $4.60

Brown U., Div. of Applied Mathematics, Providence, R. I.
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE PLASTIC DEFORMATION OF CANTILEVER BEAMS SUBJECTED TO IMPULSIVE LOADING,
by S. R. Bodner and P. S. Symonds. July 61, 47p. incl. illus. tables (Technical rept. no. 71; Rept. no. C11-71)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

Presented at the Tenth International Congress of Applied Mechanics, Stresa, Italy, Sep 1960.

DESCRIPTORS: *Cantilever beams, Plasticity, Deformation, Theory, Tests, Mechanics, Test methods, Load distribution, Impact shock, Mathematical analysis, Aluminum alloys, Beams, Steel, Stresses.

The experimental techniques and the results obtained in a program to evaluate the assumptions of dynamic rigid plastic theory of beams are presented. The experiments used steel and aluminum alloy cantilever beams subjected to either a rapid velocity change at the base or to an impulsive load at the tip. A rigid plastic theory that includes the strain rate dependence of the yield stress and geometry changes is outlined for the case of the tip impulsive loading. The predictions of this theory are in satisfactory agreement with the experimental results. (Author)

AD-260 335 Div. 25, 17
(31 July 61) OTS price $2.60

Brown U., Div. of Applied Mathematics, Providence, R. I.
THE PLASTIC DEFORMATION OF A CANTILEVER BEAM WITH STRAIN RATE SENSITIVITY UNDER IMPULSIVE LOADING,
by Thomas C. T. Ting. July 61, 29p. incl. illus. tables (Technical rept. no. 70; Rept. no. C11-70)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: *Cantilever beams, Plasticity, Deformation, Impact shock, Load distribution, Theory, Mathematical analysis, Tests, Steel, Aluminum alloys, Stresses, Mechanics, Beams.

An analysis is presented of the plastic deformation of a cantilever beam with an attached tip mass, based on the assumption of rigid-plastic behavior with strain rate sensitivity, under an impulsive load at the tip. Numerical solutions of the equations of motion which appear as two non-linear simultaneous integral equations are presented. The possibility of power series expansion is also indicated. Finally, approximate solutions are given, and the results are compared with the more exact solutions and with experimental data. (Author)

AD-260 336 Div. 25
(31 July 61) OTS price $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
A RECIPROCAL THEOREM FOR LINEAR ELECTROSTRICTION WITH SOME APPLICATIONS,
by R. J. Knops. June 61, 17p. (Technical note no. BN-249)
(Contract AF 49(638)228; In cooperation with Brown U., Contract DA 19-020-ORD-4725)
(AFOSR-1007)
Unclassified report

DESCRIPTORS: *Dielectrics, *Electric fields, *Deformation, Stresses, Mathematical analysis, Elasticity, Dipole moments, *Piezoelectric effect.

A reciprocal theorem is presented for linear electrostriction. It is used to derive an integral representation for the displacement and expressions for the mean-value of the stresses and strains. (Author)

AD-260 344 Div. 25, 8
(7 Aug 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ENDFIRE ECHO AREA OF PLASMA CYLINDER CONFIGURATIONS,
by Leon Peters, Jr. 15 May 61, 23p. incl. illus. 14 refs. (Scientific rept. no. 3; Rept. no. 1116-6)
(Contract AF 19(604)7270)
(AFCRL-382)
Unclassified report

DESCRIPTORS: *Radar echo areas, *Plasma physics, Electromagnetic wave reflections, Satellite vehicles, *Re-entry vehicles, Radar antennas, Antenna radiation patterns, Wake, Detection, Cylindrical bodies.

Techniques for determining the endfire echo area of various plasma cylinder configurations are discussed. The target is considered to be a thin linear antenna that is excited by either the lowest order transverse magnetic mode or the lowest order hybrid mode. As an example these methods could be used to determine the echo area of the highly ionized wake of a re-entry body. (Author)

AD-260 366 Div. 25, 9
(31 July 61) OTS price $2.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE COMBINED EFFECT OF TENSOR CONDUCTIVITY AND VISCOSITY ON AN MHD GENERATOR WITH SEGMENTED ELECTRODES,
by A. Sherman and G. W. Sutton. June 61, 24p. incl. illus. (Rept. no. R61SD100)
(Contract AF 49(638)914)
(AFOSR-687) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Plasma physics, Generators, *Power supplies, Gas ionization, Tensor analysis, Conductivity, Hall effect, Electrical conductance, Viscosity, Reynolds number, Fluid flow, Electric fields, Equations, Partial differential equations, Magnetic fields, Electrodes, Accelerators.

An investigation of the combined influence of tensor conductivity, fluid viscosity and segmented electrodes was carried out for an MHD generator. A solution for the flow field, and induced magnetic field was obtained in closed form by assuming an incompressible, constant properties fluid, and two dimensional flow. Calculations are presented which show the influence of the product of electron cyclotron frequency and electron mean free time, Hartmann number, and generator loading parameter on the flow. (Author)

AD-260 372 Div. 25
(31 July 61) OTS price $4.60

General Electric Co., Cincinnati, Ohio.
HIGH TEMPERATURE HEAT TRANSFER TO CYLINDERS.
Technical note for 1 Mar 59-29 May 61,
by J. F. Cassidy, M. L. Ghai, and J. W. Reid.
29 May 61, 47p. incl. illus. 23 refs.
(Contract AF 49(638)243)
(AFOSR-872) Unclassified report

DESCRIPTORS: *Heat transfer, Gases, High temperature research, Tests, Convection, Cylindrical bodies, Gas flow, Nitrogen, Reynolds number, Enthalpy, *Thermodynamics, Instrumentation, Laminar boundary layer, Test equipment, Plasma physics, Gas ionization, Generators, Thermocouples, Tungsten, Rhenium.

A combined analytical-experimental program was performed to provide basic knowledge of heat transfer from gases at high temperatures. The principal objective of this program was to obtain information regarding the forced convective heat transfer process associated with the transition flow region in a tubular test section. The experiments were conducted in a test stand which utilized the high temperature nitrogen gas flow discharge from an electrothermal generator. The results, describing the forced convection heat transfer phenomenon in a transition flow, are presented. They quantitatively describe the Nusselt number variation with the Reynold's number and the pipe L/D ratio. A theoretical investigation of the laminar boundary layer in an electrical conducting fluid, for an arbitrarily applied magnetic field was performed. New advances in high temperature thermometry were also made. These resulted from the development and use of a tungsten-tungsten rhenium thermocouple system. Improved probe calibration methods demonstrated the probe's temperature and pressure measurement capabilities in gases temperatures as high as 5600 F. (Author)

AD-260 388 Div. 25
(31 July 61) OTS price $3.60

Washington Square Coll., New York U., N. Y.
RESEARCH ON SOLID STATE RADIATION-INDUCED PHENOMENA.
Quarterly progress rept. no. 5, Feb-Apr 61,
by Hartmut Kallmann. June 61, 40p. incl. illus.
(Contract DA 36-039-sc-85126)
Unclassified report

DESCRIPTORS: *Solid state physics, *Solids, *Radiation damage, Gamma rays, Fluorescence, Benzenes, Alkoxy radicals, Methyl radicals, Molecular structure, Carbon tetrachloride, *Organic solvents, Luminescence, Impedance, Phosphors, Zinc compounds, Sulfides, Silver, X-rays, Conductivity, Temperature, Infrared radiation, Organic compounds.

GAMMA RAY-INDUCED FLUORESCENCE OF p-OLIGOPHENYLENES: The gamma ray-induced fluorescence of methyl and methoxy substituted p-oligophenylenes is studied. The methyl substitution does not greatly change the fluorescence intensity, but the methoxy substitution greatly enhances the fluorescence in some cases. Introduction of CCl4 as a quencher gives results which differ somewhat from the usual behavior found with other solutes. SIMULTANEOUS LUMINESCENCE AND IMPEDANCE MEASUREMENTS OF ZnS PHOSPHORS UNDER ILLUMINATION WITH X-RAYS, (Glow Curves): Investigations of the glow curves of ZnS-Ag show that this phosphor has four maxima in conductivity and three maxima in luminescence in the temperature range of liquid nitrogen to room temperature. The luminescence maxima occur at lower temperatures than the conductivity maxima. One conductivity maximum seems to be due to a hole conductivity, thus emptying an activator level. Under excitation at various stable temperatures between liquid nitrogen and room temperature, we lose the shallowest maxima in the glow curves more and more. TEMPERATURE DEPENDENCE OF INTENSITY OF FLUORESCENCE: The variation of intensity of fluorescence with temperature was measured for a number of organic solutions. (Author)

AD-260 406 Div. 25, 8
(31 July 61) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ELECTRON COLLISION FREQUENCY DETERMINATION IN H2,
by M. Ettenberg and M. Mentzoni. 1 May 61, 20p. incl. illus. (Research rept. no. PIBMRI-894-61; Scientific rept. no. 1)
(Contract AF 19(604)7216)
(AFCRL-352) Unclassified report

DESCRIPTORS: *Plasma physics, Gas ionization, Hydrogen, Tests, *Microwave probes, X band, *Microwave frequency, Radiofrequency power, Radio interferometers, Reflection, Microwaves, Electrons, Propagation, Wave transmission, Mathematical analysis, Determination.

Various diagnostical methods for a uniform plasma are treated analytically for the case of one dimensional and rectangular geometry. Of special significance are the graphical solutions for the case of a cosine electron density contour, which lead to normalized curves of wide applicability. The electron collision frequency in hydrogen was found as a result of this analysis, the value is nu = 1/2.3 times 10 the 9th power sec at rho = 2 mm Hg. (Author)

AD-260 476 Div. 25,
(1 Aug 61) OTS price $8.10

Stanford U. Div. of Engineering Mechanics, Calif.
APPLICATIONS OF A RECIPROCAL THEOREM OF LINEAR THERMOELASTICITY,
by J. N. Goddier and Gale E. Nevill, Jr.
15 May 61, 78p. incl. illus. 25 refs. (Technical rept. no. 128)
(Contract Nonr-22589, Proj. NR-064-241)
Unclassified report

DESCRIPTORS: *Thermal stresses, *Thermal expansion, *Thermodynamics, Elasticity, Mathematical analysis, Partial differential equations, Beams, *Structures, Girders, Structural shells.

The purposes of this investigation are to consider possible techniques for application of the theorem given by Goodier; to bring a number of problems under the unified treatment of the theorem; and to investigate the applicability of other general theorems of linear elasticity to thermoelastic problems. Two basic techniques for application of the theorem have been utilized. The first employs existing isothermal concentrated force solutions as auxiliary problems, with the theorem, to find the thermoelastic displacement of the point of application of the load of the auxiliary problem. The second is a Fourier procedure in which the required thermoelastic displacement is expressed in series form and the coefficients determined using the theorem together with solutions to auxiliary problems with single term Fourier loadings. The orthogonality properties of the circular and other functions used allow separation of the individual coefficients. (Author)

AD-260 478 Div. 25, 30
(31 July 61) OTS price $1.60

Tracerlab, Inc., Waltham, Mass.
PRINCIPLES OF A NARROW BAND X-RAY DETECTOR,
by Joris M. Brinkerhoff. 27 Mar 61, 14p. incl. illus. (Rept. no. G-471)
(Contract AF 30(602)2189)
(RADC TN 61-125) Unclassified report

DESCRIPTORS: *X-rays, *Dectectors, Narrow-band, Mathematical analysis, *Radiation counters, Atomic number, Transmission, Reflection, Silver, Palladium, Absorption.

An x-ray detector is described whose counting efficiency is of substantial value only between two narrowly separated and sharply defined limits. While the efficiency within these limits is not a full 100%, only rather moderate sacrifice in counting efficiency is required to obtain discrimination ratios of the order of one hundred or more. The principle of operation lies in the fact that the transmission and reflectance of materials of adjacent (or nearly adjacent) atomic number are both of substantial value for only a narrow band of energies, viz., those falling between the x-ray absorption edges of the two materials. A simplified mathematical treatment of this system is presented. A numerical example is also given for the case of transmission by silver (Z = 47) and reflection by palladium (Z = 46) and shows an upper limit of discrimination ratio of 400:1 for a bandwidth of 1.2 kev centered at approximately 25 kev energy. (Author)

AD-260 519 Div. 25
(3 Aug 61) OTS price $3.60

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
A THEORETICAL STUDY OF LONGITUDINAL STRAIN PULSE PROPAGATION IN WIDE RECTANGULAR BARS,
by Orval Jones and Albert T. Ellis. Apr 61, 33p. incl. illus. tables, 14 refs. (Rept. no. E-108.14)
(Contract N123(60530)24917A)
Unclassified report

DESCRIPTORS: *Rods, Elasticity, Stresses, Deformation, *Wave transmission, Theory, Motion, Mathematical analysis, Vibrations, Mechanics, Differential equations, Equations, Photoelasticity.

The propagation of a longitudinal elastic strain pulse in a wide rectangular bar is considered on the basis of approximate plane-stress equations of motion. Asymptotic expressions are obtained which, for large distances of travel, describe the pulse propagation in a semi-infinite strip with stress-free lateral edges, subject to the conditions that a uniform normal stress with a step-function time dependence is applied to the end and that the end is laterally constrained. Particular emphasis is given to describing the warping of plane sections during passage of the strain pulse. (Author)

AD-260 520 Div. 25
(3 Aug 61) OTS price $3.60

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL STUDY OF LONGITUDINAL STRAIN PULSE PROPAGATION IN WIDE RECTANGULAR BARS,
by Orval Jones and Albert T. Ellis. Apr 61, 28p. incl. illus. tables, 12 refs. (Rept. no. E-108.15)
(Contract N123(60530)24917A)
Unclassified report

DESCRIPTORS: *Rods, *Wave transmission, Elasticity, Mechanics, Stresses, Deformation, Vibration, Motion, Theory, Mathematical analysis, Tests, Impact shock, Photoelasticity, Aluminum, Equations, Differential equations, High speed photography.

The plane-stress theory is shown to qualitatively predict the warping of plane sections observed in transient fringe patterns obtained using birefringent coatings and in dynamic photoelastic pictures obtained by other investigators. Measurements using conventional techniques are

described in which wide rectangular bars were subjected to a longitudinal step-function pressure loading produced by a shock tube. Comparisons show that the gross features of the experimental records for the head of the pulse are qualitatively predicted by the theory. Both theory and experiment show that short-wavelength second mode disturbances arrive very early. Experimentally it is observed that these disturbances are accompanied by thickness mode activity which cannot be accounted for by the plane-stress theory. (Author)

AD-260 522 Div. 25, 8
(3 Aug 61) OTS price $2.60

Microwave Lab., Stanford U., Calif.
THE EFFECTS OF FLUCTUATIONS ON PROPAGATION THROUGH A PLASMA MEDIUM,
by G. S. Kino and N. A. Allen. Apr 61, 15p. incl. illus. table (Scientific rept. no. 30; ML rept. no. 802)
(Contract AF 19(604)1930)
(AFCRL-343) Unclassified report

DESCRIPTORS: *Plasma physics, Plasma oscillations, Electromagnetic waves, *Microwaves, *Propagation, *Phase modulation, Sidebands, Radio waves.

Random fluctuations of the electron density of a plasma medium degrade the characteristics of a microwave signal which is passed through it. Typically the examination on a spectrum analyzer of an rf signal which has been passed through a laboratory plasma reveals a transfer of energy into sidebands of the original frequency. In dc discharges the main components observed are those due to the strong oscillations which occur in the low-frequency range below one megacycle. A theory of phase modulation of an rf signal by the low-frequency fluctuations of a plasma is described. It is shown that strong sidebands should be expected, and that under certain circumstances the original carrier amplitude may become zero. The results obtained agree well with experimental measurements carried out on a plasma column modulated in density by an external low-frequency signal. (Author)

AD-260 523 Div. 25, 17
(2 Aug 61) OTS price $15.00

Callery Chemical Co., Pa.
DETERMINATION AND ANALYSIS OF THE POTENTIALITIES OF THERMAL ENERGY STORAGE MATERIALS.
Rept. for May 60-June 61,
by H. W. Wilson, K. W. Beahm, and W. J. Cooper. 30 June 61, 129p. incl. illus. tables, 47 refs.
(Contract AF 33(616)7224, Proj. 8128)
(ASD TR 61-187) Unclassified report

DESCRIPTORS: *Materials, Thermal conductivity, Enthalpy, Density, Heat transfer, Melting, Viscosity, Physical properties, *Alloys, *Salts, *Alums, Theory, Mathematical analysis, Measurement, Determination, High temperature research, Thermodynamics, Heat, Storage, Heat of reaction, Heat of fusion, *Bibliography.

An extensive literature search was made to select as many potential heat storage materials as possible. A number of chemical compounds, binary alloys, and double salts were found which had melting points in the range of interest. Magnesium silicide, calcium silicide and lithium metaborate, were recommended for early testing on the basis of their relatively low melting points and probable compatibility with container materials. An experimental program to measure various physical properties of candidate materials was initiated. The latent heat of fusion, enthalpy, melting point, liquid density, viscosity, coefficient of expansion, and thermal conductivity of the candidate heat storage materials were measured. Three storage system configurations were analyzed: (1) storage material in cylindrical capsules, (2) storage material in the annulus between concentric cylinders, and (3) storage material in thin blocks whose shape conforms to the shape of the working fluid reservoir. (Author)

AD-260 534 Div. 25, 8
(3 Aug 61) OTS price $5.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
ACOUSTIC MODULATION OF THE CONDUCTIVITY OF SALT SOLUTIONS,
by W. K. Rivers, Jr., D. F. Eagle, and others. 28 June 61, 40p. incl. illus. tables. (Technical rept. no. 1)
(Contract Nonr-99108, Proj. NR 371-330)
Unclassified report

DESCRIPTORS: *Conductivity, *Sea water, Salts, Sodium compounds, Chlorides, *Acoustics, Audiofrequency, Modulation, Electromagnetic waves, Dielectrics, *Electromagnetic wave reflections, Dielectric properties, Perturbation theory, *Amplitude modulation, Measurement, *Sound transmission, Surface properties, Surfaces, Very high frequency, Very low frequency, Radiofrequency.

The fractional change of the conductivity of aqueous sodium chloride solutions produced by an acoustic wave were measured and found to be 0.7 x 10 to the -10th power per dyne/sq cm pressure change at room temperature over a concentration range of 0.3 to 3.0 molal. The measurements are consistent with predictions based on theory and static data and with previous measurements of the change in the low-frequency bulk conductivity of salt water produced by an acoustic wave. The measurements were made by reflecting electromagnetic and acoustic waves from the salt water surface in a coaxial test cell at a radio frequency of 146 mc and acoustic frequencies in the range of 15 to 30 kc. The equipment used is capable of measuring an amplitude modulation index lower than 160 db below 100% for 1 cps of bandwidth. (Author)

AD-260 564 Div. 25, 13, 2
(3 Aug 61) OTS price $21.00

Office of the Secretary of Defense, Research and Engineering, Washington, D. C.
SHOCK, VIBRATION AND ASSOCIATED ENVIRONMENTS. PART III.
July 61, 362p. incl. illus. tables, 192 refs.
(Bulletin no. 29, pt. 3)
Unclassified report

The 29th Symposium on Shock, Vibration and Associated Environments was held at the U. S. Naval Supply Center, Oakland, California on November 15-17, 1960. The Department of the Navy was host.

DESCRIPTORS: *Symposia, *Shock waves, Tests, *Vibration, *Electronic equipment, Analysis, Test methods, *Guided missiles, Design, Test equipment, *Soils, Stresses, *Underground structures, Earthquakes, Air blast, *Shelters, *Shock, Nuclear weapons, Blast, Explosions.

Unclassified papers on free-field phenomena, interaction of soils with structures, structural design, and effects on equipment in hardsites are presented. (Author)

AD-260 576 Div. 25, 30
(3 Aug 61) OTS price $1.10

Rensselaer Polytechnic Inst., Troy, N. Y.
PULSED ULTRASONIC STUDIES OF SOLIDS.
Final rept. 1 Nov 57-30 Apr 61,
by H. B. Huntington. 30 Apr 61, 4p.
(Contract DA 30-115-ORD-869, Proj. 1912)
(AROD rept. no. 1912:1) Unclassified report

DESCRIPTORS: *Solids, *Ultrasonic radiation, Velocity, Attenuation, *Sound, Acoustics, *Single crystals, Elasticity, Temperature, Plasticity, Light, Damping.

Ultrasonic techniques and their application to the measurements of velocity and attenuation in solids are discussed. (Author)

AD-260 577 Div. 25
(3 Aug 61) OTS price $9.10

Saarbrucken U. (Germany).
THE ELECTROMAGNETIC FIELD RESULTING FROM THE RADIATION OF A MAGNETIC DIPOLE IN A MEDIUM POSSESSING A GRADIENT OF DIELECTRIC CONSTANT OF A NATURE APPROXIMATING THE DISTRIBUTION OF DIELECTRIC CONSTANT IN A DUCT ABOVE AN INFINITELY CONDUCTING PLANE EARTH.
Final rept. 1 July 60-30 June 61,
by Gottfried Eckart. 30 June 61, 109p. incl. illus. tables, 19 refs.
(Contract DA 91-591-EUC-1480)
Unclassified report

DESCRIPTORS: *Electromagnetic fields, Ducts, Dipole antennas, Dielectrics, *Dielectric properties, Integral equations, Special functions, Partial differential equations.

AD-260 579 Div. 25, 8
(3 Aug 61) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
STUDIES OF MICROPLASMAS AND HIGH-FIELD EFFECTS IN SILICON.
Quarterly status rept. no. 4, 1 Mar-31 May 61,
by J. L. Moll and S. Sze. 31 May 61, 23p. incl. illus. tables.
(Contracts DA 36-039-sc-85339 and Nonr-22524)
Unclassified report

DESCRIPTORS: *Silicon, Plasma physics, Thin films, *Semiconductors, Electric fields, Lattices, *Photoemission, Electrons, Diffusion, Theory, Photoelectric materials, Photoelectric effects, Mathematical analysis, Tests.

The experimental calibration of the etch rate for boiling-water/HF-dip etching has been carried out by using a microbalance to measure weight loss. This calibration has been used to obtain impurity profiles for different layers of about 1000 angstroms depth. Experimental results are reported for electron emission from silicon p-n junctions. The theoretical form for hot electron distributions for several extreme conditions of mean free path and ionization threshold is derived. (Author)

AD-260 589 Div. 25, 24, 2
(3 Aug 61) OTS price $8.10

Texas Technological Coll., Lubbock.
STUDY OF SHORT TERM VARIATIONS IN THE OPTICAL TRANSMISSION OF THE ATMOSPHERE AT SHORT DISTANCES USING THE SCHLIEREN TECHNIQUE.
Final technical rept. 31 Mar 59-31 May 61,
by Preston F. Gott. 31 May 61, 88p. incl. illus. 20 refs.
(Contract DA 23-072-ORD-1423)
(AROD-2382:1) Unclassified report

DESCRIPTORS: *Atmosphere, *Light transmission, Schlieren photography, Measurement, Optics, *Atmospheric refraction, Optical instruments.

Motion picture records at 92 frames per second of schlieren observations of the free atmosphere have been made using a variety of schlieren arrangements with path distances of 24 feet to 200 feet, at night and in full daylight. The observations are consistent with a model in which rays traveling as short a distance as 24 feet, 6 feet above the ground, are refracted so as to be deviated by several refractive gradient regions in this distance. These regions are apparently rough surfaces bounding volumes of air larger than the telescope objective area and which are at a temperature different from the surrounding air due to heating or cooling by contact with the ground or with the tube of the telescope. The telescope-induced artifacts can be reduced by use of a sunshade over the entrance of the telescope. Schlieren records give an excellent presentation of the shapes and motions of areas on a telescope objective which send light to displaced portions of the image. Data as to intensity of light from a given portion of the objective area are complicated by moderately high levels of scattered light which have to be dealt with in a schlieren system operated under outdoor conditions. Tests indicate that color schlieren and an application of the Hartmann test might give data which would make the determination of deviation of flux a more quantitative measure. (Author)

AD-260 591 Div. 25, 26
(31 July 61) OTS price $5.60

Union Thermoelectric Corp., Chicago, Ill.
MILITARY QUARTZ CRYSTAL UNITS 100-125 MC (CR-56/U).
May 61, 52p. incl. illus. tables.
(Contract DA 36-039-sc-71061)
Unclassified report

DESCRIPTORS: *Quartz crystals, *Quartz resonators, Crystals, Crystal holders, Very high frequency, Military requirements, *Harmonic oscillators, Crystal oscillators, Production, *Manufacturing methods, Processing, Design, Surfaces.

An investigation was made of crystal units (HC-18/U holder type) to establish general design and production data. It was concluded that the design of 5th harmonic quartz crystal resonators to operate in the frequency range from 100 to 125 mc is the same as the design for the entire 5th harmonic range above 50 mc, and can be extended at least as high as 150 mc. Diameter is not critical and the HC-18/U holder is large enough. Processing is more critical as the frequency is increased, and a polishing system was recommended as well as a mount of new design. (Author)

Division 25 - PHYSICS

AD-260 664 Div. 25
(3 Aug 61) OTS price $2.60

Magnetogastrodynamics Lab., Mass. Inst. of Tech., Cambridge.
PLASMA BOUNDARY LAYERS,
by James A. Fay. June 61, 18p. incl. illus.
(Rept. no. 61-8)
(Contract AF 49(638)643)
(AFOSR-994) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Ionization, *Boundary layers, Transport properties, Magnetic fields, *Plasma physics, Kinetic theory, Ions, Atoms, Electrons, Heat transfer, Gases, Diffusion, Mathematical analysis, Electric fields, Electrical conductance, Thermal conductivity.

Some aspects are considered of boundary layer type flows in gases which are partially or wholly ionized. The change in transport properties due to ionization are estimated and the resulting effects on heat transfer in a monatomic gas are determined. A type of magnetohydrodynamic boundary layer encountered in channel flows where there exists an applied magnetic field normal to the wall is considered. Finally, the laminar diffusive mixing of a magnetic field and a compressible plasma is studied. (Author)

AD-260 669 Div. 25, 17
(4 Aug 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FIAT REVIEW OF GERMAN SCIENCE 1939-1946 - GENERAL METALLURGY (SELECTED ARTICLES) (Fiat Review of German Science 1939-1946, Allgemeine Metallurgie).
14 Feb 61, 42p. incl. tables, 40 refs. (Trans. no. MCL-710)
Unclassified report

DESCRIPTORS: Solid state physics, Metals, Alloys, Crystals, Crystal structure, *Metallic crystals, Single crystals, Lattices, Deformation, *Elasticity, *Plasticity, Stresses, Shear stresses, Thermal conductivity, *Bibliography, Crystallization, Germany.

ELASTIC PROPERTIES: Temperature dependence of the modulus of elasticity; Concentration dependence of the modulus of elasticity; Influence of mechanical and thermal treatment on the modulus of elasticity; Influence of the ferromagnetic state on the modulus of elasticity; Measurements on single crystals; and Determination of the modulus of elasticity. PLASTIC DEFORMATION AND RECRYSTALLIZATION: Plastic deformation, solidification, recovery (Homogeneous and inhomogeneous deformation of single crystals, deformation of polycrystals, deformed state, and endurance limit at unidirectional and alternating stress); and Recrystallization (Recrystallization in worked bodies and unworked bodies).

AD-260 721 Div. 25, 12, 20, 16
(4 Aug 61) OTS price $9.60

RCA Service Co., Inc., Patrick Air Force Base, Fla.
RF RADIATION HAZARDS. AIR FORCE MISSILE TEST CENTER, ORDNANCE - BIO-EFFECTS - FUEL,
by O. B. Rawls, R. J. Stilwell, and B. M. McDonald. July 61, 117p. incl. illus. tables, 27 refs.
(Subcontract to Pan American World Airways, Inc.)
(AFMTC TR 61-14: Supersedes AFMTC TN 59-4)
Unclassified report

DESCRIPTORS: *Radiation hazards, Radar, Intensity, Guided missiles, Safety, Handling, *Ordnance, Theory, *Electric igniters, Radiofrequency, Sources, Electromagnetic fields, Test facilities, Microwaves, *Guided missile personnel, Physiology, Countermeasures, Fuels.

An analysis of Air Force Missile Test Center radiation sources, which constitute potential radiation hazards, is discussed. The analysis is in three parts; Parts I, II, and III deal with ordnance, bio-effects and fuel, respectively. Within Parts I, II and III, tabulations have been included which show the extent of hazardous radiation to ordnance for each missile complex; the areas dangerous to personnel; and the areas surrounding the individual instrumentation systems within which fueling operations may be dangerous when irradiated. A map of Cape Canaveral showing instrumentation site locations and average effective radiated powers is included. (Author)

AD-260 746 Div. 25, 4, 7
(8 Aug 61) OTS price $1.60

Little, Arthur D., Inc., Cambridge, Mass.
RESEARCH IN ELECTRICAL PHENOMENA ASSOCIATED WITH AEROSOLS.
Quarterly rept. no. 3, 15 Jan-15 Apr 61,
by Bernard Vonnegut, Arnold W. Doyle, and Philip M. Sliney. 21 July 61, 12p. incl. illus. table.
(Contract DA 18-108-405-cml-852)
Unclassified report

DESCRIPTORS: Ions, *Electrical properties, Drops, *Aerosols, High speed photography, Electrostatic precipitation, Production, Spark shadowgraph photography, Electrostatics, Spectrographic analysis, Instrumentation, Particles, Velocity, Particle trajectories, Atomization.

An ion spectrometer was built to measure the mobilities of charged aerosols. Mobilities were measured for particles down to 0.3 microns in diameter. Difficulties were encountered with the smaller particles; however, large particles are easily handled. The electrical atomization of organic liquids was studied. Particle size at low voltages and low drop frequency was seen to vary as the square root of surface tension. At high voltages low electrical conductivity can strongly influence the atomization. The susceptibility of a liquid to submicron atomization at higher voltages was found to be dependent on electrical conductivity. Charge per drop for a given drop size was found to be constant. Polarity and capillar diameter do not have a strong influence on the atomization process over the ranges investigated. (Author)

AD-260 765 Div. 25
(9 Aug 61) OTS price $5.60

Naval Ordnance Lab., White Oak, Md.
A HIGH-SPEED ELECTROMECHANICAL SHUTTER,
by Paul A. Kendall. July 61, 54p. incl. illus.
(NAVWEPS Rept. no. 7362) Unclassified report

DESCRIPTORS: *Spectrographic cameras, *Camera shutters, Thermal radiation, Compressors, Magnetic fields, Design, High speed photography, Calibration, Instrumentation, Triggered gate, Trigger circuits, Spectrographic analysis, Quartz.

An electromechanical shutter with submillisecond open time was designed and constructed for accurately controlling the recording period of a Bausch and Lomb medium quartz spectrograph. By

mechanically harnessing the magnetic field set up by a high current surge through a small flattened wire, a slotted shutter located in front of the slit of a spectrograph is opened in about 15 microseconds after the shutter is triggered. The open time of the present shutter can be varied from 100 to 500 microseconds and its closing time is about 5 microseconds. The shutter plate can be easily modified so that the minimum open time and closing time are each about 1 microsecond. (Author)

AD-260 767 Div. 25, 8
(7 Aug 61) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
HIGH TEMPERATURE SEMICONDUCTOR RESEARCH.
Scientific rept. no. 5, 1 Jan-31 Mar 61,
by L. R. Weisberg. 30 Apr 61, 55p. incl. illus. tables.
(Contract AF 19(604)6152)
(AFCRL-383) Unclassified report

DESCRIPTORS: *Semiconductors, *High temperature research, Single crystals, Growth, Gallium compounds, Phosphides, Arsenides, Intermetallic compounds, *Thin films, Electrical properties, Diodes, Preparation, Chemical impurities, Ionization, Iodine, Copper, Zinc.

The high pressure magnetic Czochralski apparatus for the growth of GaP single crystals was put into operation. The preferred growth planes for GaAs thin films was found to be the (211) and (110). Apparatus was constructed and tested to measure the vapor pressure and vapor species during the iodine transport film growth of GaAs. A summary is presented of the ionization energy levels found to date in GaAs, together with their salient properties and the methods used for their detection. A comprehensive study was continued on the effects of thermal treatments of GaAs. Graded band gap junctions were formed on GaAs by epitaxially growing GaP on a GaAs substrate in the presence of tin vapor. Permanent degradation of GaAs tunnel diodes was shown to occur only when the diode is operated past the valley voltage, and not when tunneling current alone is present. (Author)

AD-260 769 Div. 25, 4
(7 Aug 61) OTS price $9.10

Raytheon Co., Waltham, Mass.
RESEARCH ON THE CHEMISTRY AND SINGLE CRYSTAL GROWTH OF MAGNETIC OXIDES.
Final rept.,
by H. J. Van Hook, A. E. Paladino and others.
5 June 61, 91p. incl. illus. tables, 46 refs.
(Rept. no. S-291)
(Contract AF 19(604)5511)
(AFCRL-513) Unclassified report

DESCRIPTORS: *Oxides, *Magnetic materials, *Ferromagnetic materials, *Single crystals, Growth, Chemical properties, Phase studies, Yttrium compounds, Iron compounds, *Garnets, Gadolinium compounds, Nickel compounds, Cobalt compounds, Solids, Solutions, Alloys, Resistance, Thermoelectricity, Electrical conductance.

Phase relationships in the liquidus range under different oxygen partial pressures are described for the oxide systems involving yttrium-iron garnet and yttrium-gadolinium-iron garnet phases. These data are applied to an analysis of the conditions for crystal growth of the incongruently melting garnet phase from oxide liquids as concerns the temperature-composition-oxygen pressure range for stable growth, and the composition of garnets crystallized under these conditions. Some preliminary results are presented on single crystal growth of yttrium-iron garnet by a modification of the Czochralski technique. Phase equilibrium data in the systems Ni-Fe-O and Co-Fe-O are described with emphasis on the conditions necessary to prepare the spinel solid solutions Fe_3O_4-$NiFe_2O_4$ and Fe_3O_4-Co_3O_4. Cation distribution studies by x-ray diffraction techniques are given for single phase spinels in the system Mg-Fe-O as well as preliminary data for spinel composition preparation in the system Fe-Al-O. The effect of substitution of the cations Ni^{2+}, Co^{2+} and Al^{3+} for divalent and/or trivalent iron on electrical conductivity in magnetite is discussed. Resistivity and thermoelectric data are given for a series of nickel ferrous ferrites and the results are analyzed quantitatively. (Author)

AD-260 775 Div. 25, 31
(4 Aug 61) OTS price $2.60

Committee on Ship Structure, National Research Council, Washington, D. C.
AN INTERPRETATION OF LOWER YIELD POINT PLASTIC FLOW IN THE DYNAMIC TESTING OF MILD STEEL.
Progress rept. no. 1 on Proj. SR-142,
by J. M. Krafft. 26 June 61, 19p. incl. illus.
(Serial no. SSC-123)
(Contract NObs-72046; In cooperation with Naval Research Lab., Washington, D. C.)
Unclassified report

DESCRIPTORS: *Ship hulls, *Steel, *Fracture (Mechanics), Failure (Mechanics), Deformation, Plasticity, Elasticity, Stresses, Measurement, Test equipment, Theory, Fluid flow, Mathematical analysis.

Evaluation of the role of rapid plastic flow in the fracture process necessitates some measure of elastic and plastic strength which will be suitable for high strain rates. Strain distribution was measured after stopping a dynamic machine during the lower yield. From head displacement and load records obtained during the test and also from plastic flow rate sensitivity measured in other high-speed tests on the same material, the strain distribution was predicted. The predicted strain distribution behind the Luders band front was in good agreement with that measured. When the velocity of the band front is corrected for its diminution owing to continued flow behind the front it is related to driving stress with a sensitivity corresponding to that for the upper yield point--or the delayed yield. (Author)

AD-260 779 Div. 25, 8
(4 Aug 61) OTS price $4.60

St. Louis U., Mo.
THEORETICAL STUDY OF PROBLEMS CONNECTED WITH THE SOLID STATE RASER.
Technical rept.,
by Mohan Lal Narchal and William A. Barker.
1 July 61, 48p. incl. illus. tables.
(Contract AF 49(638)612)
(AFOSR-954) Unclassified report

DESCRIPTORS: *Solid state physics, Brillouin zones, Lithium compounds, Fluorides, *Microwave amplifiers, Quantum mechanics.

A detailed comparison is made of the relative advantages of the Overhauser effect and the Abra-

gam effect for obtaining stimulated emission or resonant absorption of a four level system when all the thermal relaxations are taken into account. The results obtained are applied to F sub 2 negative centers in LiF for the purpose of investigating this system as a possible quantum mechanical amplifier. (Author)

AD-260 780 Div. 25
(4 Aug 61) OTS price $8.60

Smith, A. O., Corp., Milwaukee, Wis.
SEMICONDUCTING PROPERTIES OF INORGANIC AMORPHOUS MATERIALS. PART II.
Rept. for 27 July 60-26 July 61,
by H. L. Uphoff and J. H. Healy. 26 July 61, 94p. incl. illus. tables.
(Contract Nonr-296500, Proj. NR 017-446)
Unclassified report

DESCRIPTORS: *Semiconductors, Thermoelectricity, Resistance, Electrical conductance, Crystal structure, Crystals, Thermal conductivity, Temperature, Antimony compounds, Arsenic compounds, Selenium compounds, Tellurium compounds, Bismuth compounds, Microstructure, Test methods, Intermetallic compounds, Hall effect, Tellurides, Selenides, Materials.

Twenty-five sample compositions were prepared from combinations of the elements Sb, As, Bi, Se, S, Te, and Tl. Twelve compositions were amorphous in structure, while the remainder were diphasal containing both amorphous and crystalline phases. The amorphous materials all possessed an exponential resistivity-temperature relationship with negative temperature coefficient. The resistivity values for the diphasal materials with a high degree of crystallinity were practically independent of temperature, while a number of the slightly crystalline samples showed an apparent transition from crystalline to amorphous properties. All of the amorphous materials and most of the diphasal materials had a positive Seebeck coefficient. Room temperature Hall constant values were determined for a number of the new compositions and also for compositions in the series As2Te3-As2Se3. The thermal conductivity values for the materials tested increased as the degree of crystallinity was increased. (Author)

AD-260 791 Div. 25
(4 Aug 61) OTS price $1.60

Oklahoma U. Research Inst., Norman.
THE MELTING CURVES OF TIN AND SELENIUM TO 10,000 BARS,
by Stanley E. Babb, Jr. June 61, 18p. incl. illus. 10 refs. (Technical rept. no. 1)
(Contract Nonr-98205)
Unclassified report

DESCRIPTORS: *High pressure research, Laboratory equipment, Pressure vessels, Pressure gages, Metal seals, Heaters, Circuits, *Tin, *Selenium, *Melting, Temperature, Pressure, Design.

Melting studies were made on Sn and Se, and equations are given which can be used to calculate the melting pressure of these substances at any temperature to pressures of 10,000 bars. The intensifier for the generation of pressure consisted of a ram of about 4.5-in. inner diameter and 6-in. outer diameter which drives a 0.654-in.-diam piston. The steel pressure cell has a 0.5-in. inner diameter and a 3.0-in. outer diameter with a usable bore of 6-in. Pressure measurements were obtained with a manganin wire resistance gage. A 1000-w electric heater was used to heat a bath of Na, K, and Li nitrates which remained fluid below 150 C and did not cause corrosion of the steel parts immersed in it. Details of the heater and gage circuits and pressure seals are presented.

AD-260 797 Div. 25, 22
(7 Aug 61) OTS price $3.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
ELECTROMAGNETIC RADIATION HAZARDS TO EXPLOSIVES SURVEY OF ELLSWORTH AIR FORCE BASE, SOUTH DAKOTA.
Airmunitions test rept.
by Harold R. Laughter. June 61, 41p. incl. illus. (Rept. no. OOY-TR-61-22)
Unclassified report

DESCRIPTORS: *Radiation hazards, *Electromagnetic effects, Radar, *Explosives, Safety, Handling, Measurement, Electric igniters, Storage.

The purpose of this survey was to determine the extent of electromagnetic radiation hazards to explosives in storage, handling and shipping areas in the vicinity of the A.C. and W. site at Ellsworth Air Force Base, South Dakota. Field strength measurements of the main beams from the AN/FPS-20 and AN/MPS-14 radars were made at various locations in the aforementioned areas and along the transportation route. Various electrically initiated explosive items were exposed to the main beam of the radars, following the highest terrain possible into the AN/MPS-14 radar system. It was concluded that a degree of hazard does exist along the transportation route to the munitions storage area. (Author)

AD-260 799 Div. 25
(8 Aug 61) OTS price $8.10

Oklahoma State U. Research Foundation, Stillwater.
MEASUREMENT OF THE ACOUSTIC FIELD OF RADIATING CIRCULAR AND RECTANGULAR APERTURES AND A SCATTERING CIRCULAR DISK.
Master's thesis,
by C. W. Miller and G. B. Thurston. July 61, 82p. incl. illus.
(Contract Nonr-259503, Proj. NR 385-545)
Unclassified report

DESCRIPTORS: *Acoustics, *Sound, Propagation, Measurement, *Wave transmission, Instrumentation, *Oscilloscopes, Reflection, Disks.

The results are described of measurements of the acoustic field of radiating circular and rectangular apertures and the scattering around a circular disk. The field parameters determined include the pressure, the phase of the pressure, the pressure gradient, and the phase of the pressure gradient. Measurements described are for sonic frequencies in air. Short tone bursts were used in the measurements. The measurement technique described is that of synthesis and analysis of a continuous electrical signal which is in coincidence with a selected portion of the signal representing the pulsed acoustic field variable. Measured results are compared with the results of simple elementary theoretical analyses of the cases considered. (Author)

26. PRODUCTION AND MANAGEMENT

AD-260 001 Div. 26, 17, 1
(25 July 61) OTS price $1.60

Northrop Aircraft, Inc., Hawthorne, Calif.
PROGRAM FOR THE DEVELOPMENT OF EXTRUDED BERYLLIUM SHAPES.
Interim engineering rept. no. 12, 1 Mar-31 May 61.
31 May 61, 17p. incl. illus. (Rept. no. NOR 61-163)
(Contract AF 33(600)36931)
Unclassified report

DESCRIPTORS: *Beryllium, Extrusion, Dies, Airframes, Surface properties, Metal coatings, Coatings, Steel, Copper coatings, Lubrication, Design, Mica.

Efforts included planning, design tooling fabrication, and experimental extruding efforts to verify and develop die design. No attempts at a full 20-ft length extrusion were made. Pushes were limited to 4-in. long billets to obtain data on die behavior at minimum cost. The first extruding attempt incorporating composite lubricant technique was made before receipt of the new dies. The short billet was pushed to give a preliminary indication of the distribution and of the relative thicknesses of the Be, steel, and Cu. Comparative measurements were made at various sections and the new die designs predicated on the findings. The 3 new type dies were used with short billets to give an indication of which die design gave the best streamline flow. Of the 3, the best was selected and evaluated with a resultant minor change being made to the pattern. (Author)

AD-260 060 Div. 26, 17
(20 July 61) OTS price $15.50

Solar Aircraft Co., San Diego, Calif.
DEVELOPMENT OF HIGH TEMPERATURE RADIANT GAS BRAZING METHOD FOR HONEYCOMB PANELS.
Final technical engineering rept. 5 Dec 58-8 Dec 60,
by W. C. Troy. May 61, 227p. incl. illus. tables.
(Contract AF 33(600)38317, Proj. 7-661)
(ASD TR 61-7-661) Unclassified report

DESCRIPTORS: *Sandwich panels, Honeycomb cores, *Brazing, Processing, Manufacturing methods, *Radiant heating panels, Steel, Stainless steel, Effectiveness, Design, Mechanical properties, Soldering alloys, Tests, Heat resistant alloys.

An effective low cost radiant gas method for brazing honeycomb sandwich was developed using small radiant burners. Thermal control and configurational flexibility inherent in the new brazing method permits great simplification in high temperature tooling, leading to lower product costs. In addition, the development of simplified panel assembly procedures provides a process which consistently furnishes metallurgically sound components from PH 15-7 Mo and A-286 which normally braze with difficulty. An extensive program of mechanical tests evaluated the quality of the honeycomb sandwich panels. (Author)

AD-260 072 Div. 26, 17
(21 July 61) OTS price $3.60

Westinghouse Electric Corp., Blairsville, Pa.
HIGH ENERGY RATE EXTRUSION.
Interim technical progress rept. no. 3, on Phase 2, 1 Apr-30 June 61,
by G. A. Reimann. July 61, 32p. incl. illus. table.
(Contract AF 33(600)41948)
(ASC TR 7-882, vol. 3) Unclassified report

DESCRIPTORS: *Machine tools, *Metals, *Extrusion, Explosive forming, Pneumatic systems, Dies, Tools, Design, Processing, Manufacturing methods, Steel, Titanium alloys, Airframes, Aluminum alloys, Hydraulic systems.

The hardness of the multiple-orifice dies began to decrease when billet temperatures above 900 C were employed. Based on the results obtained from 29 extrusions through the multiple-orifice dies, 3 single bore dies were designed with entry angles of 90, 105, and 120 degrees for experiments on extrusions of long lengths. Grease and graphite lubrication was used for all extrusions, but Al billets were the only ones benefiting from the lubrication. Grease and graphite were effective to a lesser degree with steel billets at 900 C and 500 psi fire pressure, but was considered ineffective at 1100 C and 800 psi fire pressure. Billets of 1-7/8 in. diam by 2 in. length Al alloy, AISI 1020 steel, AISI 4340 steel, and 6 Al-4V-90Ti alloy were extruded at various temperatures and fire pressures; 304 stainless steel billets were 2 to 2 1/2 in. A method was devised to determine the energy developed by the Dynapak for various combinations of fire pressure, back pressure, and stroke length.

AD-260 081 Div. 26, 22
(26 July 61) OTS price $1.10

Eaton Mfg. Co., Detroit, Mich.
(No title).
Final rept. for 16 June 58-16 June 61,
by James A. Crabtree. 11 July 61, 3p.
(Contract DA 20-018-504-ORD-98; Continuation of Contract DAI 20-018-504-ORD(P)-46)
Unclassified report

DESCRIPTORS: *Springs, *Helical springs, Guns, Manufacturing methods, Production, Test methods, Life expectancy, Fatigue (Mechanics), Stresses, Tensile properties, Mechanical properties, Military requirements, Specifications, Small arms.

Methods of pre-stressing driving springs were investigated; included were the pressing of springs one or more times to their actual solid, cycling or gymnastification of a spring part prior to assembly, and locking up of a spring at its solid height for an extended period. Hot pressing or heat setting techniques to predict optimum spring designs were combined with the previously discussed processes. Fabrication and coiling techniques of stranded wire were investigated. Photographic studies of time-displacement and surge wave phenomena were made. Fine particle peening produced a marked increase in the fatigue life of the small helical compression springs. Double peening for small spring parts appears to increase life significantly. Extra high tensile materials reduced load loss in springs where high load loss and poor fatigue were experienced; however, there was a reduction in fatigue life. Preliminary work on a Military Specification was begun.

Division 26 - PRODUCTION AND MANAGEMENT

AD-260 099 Div. 26, 17
(25 July 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
GENERAL RECOMMENDATIONS ON DESIGN FEATURES FOR TITANIUM AND ZIRCONIUM PRODUCTION-MELTING FURNACES.
19 July 61, 7p. incl. illus. (DMIC memo. no. 116)
Unclassified report

DESCRIPTORS: *Titanium, *Zirconium, Melting, *Vacuum furnaces, Design, Liquid cooled, Electric arcs, Control systems, Safety devices.

An outline is presented of recommendations on design features for Ti- and Zr-melting furnaces. Special emphasis was placed on safety features. A standby cooling water system with instrumentation to indicate its serviceable condition was a principal requirement. Positive protection of personnel by a vault-type design was recommended with mechanical clamping of the furnace assembly and components, and a pressure relief device. Vacuum pumps should be vented outside the building to prevent accumulation of hydrogen. Safety features for the crucible or molds are enumerated as well as automatic devices for sensing the lack of water discharge and for cut off of electric power to the arc. A number of warning devices and instruments for visual observation or recording critical operating parameters are included.

AD-260 389 Div. 26, 1
(31 July 61) OTS price $19.75

Northrop Corp., Hawthorne, Calif.
NORTOBRAZE SYSTEM QUARTZ LAMP RADIANT HEAT BRAZING OF HIGH TEMPERATURE SANDWICH PANELS.
Final technical engineering rept. 6 Jan 60-17 Mar 61,
by H. Spector. May 61, 308p. incl. illus. tables.
(Contract AF 33(600)40457, Proj. 7-773)
(ASD TR 61-7-773) Unclassified report

DESCRIPTORS: *Sandwich panels, Airplane panels, *Brazing, Manufacturing methods, Honeycomb cores, Heat resistant alloys, Stainless steel, Heat treatment, Soldering alloys, Design, Nondestructive testing, Tests, Quality control, Radiant heating panels.

The Nortobraze system has fabrication capability for brazing PH 15-7 Mo honeycomb structures. It is sufficiently versatile to handle edge members and densified core or other heat sinks while obtaining adequate strength properties. Curved and flat-to-conic sandwich panels can be made with a high degree of brazement reliability. Successful use of moving radiant lamp source has been demonstrated for brazement and heat treatment of precipitation hardening steel honeycomb panels. (Author)

AD-260 400 Div. 26, 4
(1 Aug 61) OTS price $10.50

Rutgers U., School of Chemistry New Brunswick, N. J.
A STUDY OF THE MECHANISM OF THE ACTION OF INHIBITORS WHICH PREVENT HYDROGEN EMBRITTLEMENT OF CARBON STEELS RESULTING FROM ACID PICKLING.
Final rept. 1 Jan 56-30 Nov 60,
by Leonard Dauerman. 30 Nov 60, 129p. incl. illus. tables.
(Contract DA 30-069-ORD-1680)
Unclassified report

DESCRIPTORS: *Steel, *Hydrogen embrittlement, Countermeasures, Corrosion inhibition, Theory, Quinazolines, Amines, Formaldehyde, Pickling, Pickling compounds, Additives, Toluidines, Measurement.

CONTENTS:
Determination of the active substances in the Aberdeen inhibitor
Properties of DHQ and formaldehyde
Independent roles of DHQ and formaldehyde in inhibition
Importance of small molecular size of formaldehyde in its activity in the presence of DHQ
Formaldehyde does not neutralize the embrittlement accelerating properties of S
The comparison of several substances similar to DHQ-like properties
Theory
Basic related studies
Testing of the hypothesis that substances which absorb atomic H are good embrittlement inhibitors
Moore-Fatique vs diffusion potential tests
Relationship between electronic structure and corrosion inhibition properties in ionic radicals containing group 5 and 6 elements
Hypothesis tested that S accelerates corrosion by forming a complex with ferrous ion
Reversible electrode potentials for Fe
Procedures
Chemical and metallurgical analyses of specimens

AD-260 423 Div. 26, 17
(1 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SEAMLESS STAINLESS STEEL TUBING.
16 June 61, 3p. incl. table (AID rept. no. 61-92; Trans. from Seamless Tubing, Stainless Steel. Project: Hot-rolled Seamless Tubing from Stainless Steel. Project: Cold-drawn, Cold-rolled, and Warm-rolled Seamless Tubing from Stainless Steel. Standartizatsiya 4:41-48, Apr 61)
Unclassified report

DESCRIPTORS: *Stainless steel, *Steel tubing, Pipes, Standards, USSR, Industrial production, Steel.

The Ukrainian Scientific Research Institute for Tubing has prepared two projects of a new standard for stainless steel seamless tubing to replace GOST 5543-50. The projects include 25 steels instead of the 7 of GOST 5543-50. The projects considerably extend the available assortment of diameters and wall thicknesses. The minimum available diameter of the hot-rolled tubing will temporarily remain 76 mm, but when the necessary equipment has been built, diameters down to 57 mm will also be available. The minimum wall thickness remains 4.5 mm. The maximum available diameter will be 325 mm and the maximum thickness, 32 mm. In GOST 5543-50 the values were 219 and 30 mm, respectively. (Author)

AD-260 452 Div. 26, 27
(1 Aug 61) OTS price $1.10

Massachusetts Inst. of Tech., Div. of Sponsored Research, Cambridge.
EVALUATION OF ELECTRON BEAM WELDING FOR FABRICATION OF ULTRA HIGH STRENGTH STEEL ROCKET MOTOR CASES.
Monthly status rept. no. 11, 1-31 Mar 61,

by Clyde M. Adams, Jr. 5 June 61, 5p. incl. tables.
(Contract NOw 60-0417)
Unclassified report

DESCRIPTORS: *Welding, Electric welding, *Electron beams, Electron guns, Welds, Welded joints, Sheets, *Steel, *Rocket cases, Rocket motors, Tests, Mechanical properties, Hardness, Heat treatment, Failure (Mechanics), Preparation, Fracture (Mechanics), Tensile properties.

Tensile and tensile impact properties are tabulated for electron-beam welded H-11 steel with a variety of post-weld heat treatments. Fracture occurred outside the weld zone in more than half the specimens. Decreasing the tempering temperature caused an increase in both the strength and ductility. Electron beam re-fusion of arc welds resulted in transverse properties comparable to those obtained by electron beam welding gun with a transmission of 90% under vacuum welding conditions. By correlating hardness and peak temperature distributions, the minimum hardness in the heat-affected zone corresponded to a temperature between 1350 and 1400 F. The magnitude of the minimum hardness was sensitive to the heat treatment of the material prior to welding; the lower the prior tempering temperature, the less was the softening effect.

AD-260 465 Div. 26, 14
(31 July 61) OTS price $1.10

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
SUITABILITY OF VITON B O-RINGS FOR USE IN 3000 psi HYDRAULIC SYSTEMS CONTAINING PETROLEUM BASE OR PHOSPHATE ESTER FLUIDS.
Progress rept. no. 2,
by A. E. Barrett. 24 July 61, 4p. tables (Rept. no. 92-10)
Unclassified report

DESCRIPTORS: *Hydraulic seals, Materials, *Hydraulic systems, Hydraulic fluids, Rubber, Phosphates, Esters, Petroleum, Ethylenes, Fluorides, Polymers, Tests, Effectiveness, Synthetic rubber, Cyclohexanes.

Results of dynamic performance tests of Viton B O-rings indicate that Viton B O-rings of 70 Shore A hardness with Teflon backup rings will perform satisfactorily at 180 F in 3000 psi hydraulic systems containing phosphate ester fluids. In addition, the results indicate that the O-rings will perform equally as well under these conditions in hydraulic systems containing petroleum base fluids. As reported previously, the Teflon backup rings do not stand up at 300 F under the test conditions. Backup rings made of a 90 Shore A Viton B stock showed even greater wear. (Author)

AD-260 470 Div. 26, 17
(31 July 61) OTS price $5.60

Republic Aviation Corp., Farmingdale, N. Y.
CAPACITOR DISCHARGE METAL FORMING.
Interim technical engineering rept. no. 1,
3 Apr-3 June 61,
by J. Christiana, N. Inman, and G. Pfanner. June 61, 48p. incl. illus. 21 refs.
(Contract AF 33(600)42920)
(AMC TR 7-844, vol. 1) Unclassified report

DESCRIPTORS: *Metals, *Sheets, *Electroforming, Processing, Deformation, Shock waves, *Electric discharges, Capacitors, Magnetic fields, Pressure, Liquids, Hydrostatic pressure, Plasma physics, Manufacturing methods, Airframes, Explosive forming, Underwater explosions, Electromagnetism.

A state-of-the-art survey indicates that several organizations have satisfactorily formed small tubular parts and dished sheet parts by capacitor discharge forming. Experiments to evaluate basic phenomena are required to determine optimum process for larger parts in typical aircraft and missile configurations. The power and energy levels to form such parts will require capacitor banks which are larger than those in present use. (Author)

AD-260 483 Div. 26, 12, 1
(31 July 61) OTS price $1.60

Vitro Labs., West Orange, N. J.
FABRICATION OF CUTTING TOOLS BY ELECTROPHORETIC DEPOSITION.
Interim technical engineering rept. no. 4,
1 Mar-30 June 61,
by M. H. Ortner and K. A. Gebler. 30 June 61, 15p. incl. illus. tables.
(Contract AF 33(600)41436)
(AMC TR 7-868, vol. 4) Unclassified report

DESCRIPTORS: *Cutting tools, Manufacturing methods, Electrophoresis, Electrodeposition, Coatings, Tungsten compounds, Carbides, Tungsten alloys, Nickel alloys, Copper alloys, Carbide tools, Cobalt alloys, Lathes, Machining, Tests, Effectiveness, Processing, Airframes, Alloys, Drills.

A heavy metal substrate (93 w/o W-5 w/o Ni-3 w/o Cu) and boron-modified grade C-2 and C-6 carbide coatings were chosen for the preparation of coated lathe tool inserts. The coatings were deposited electrophoretically in thicknesses up to 0.040 in. densified by isostatically pressing at 7.5 tsi at room temperature, and then sintered in argon for 30 min at 1350 - 1400 C. Although the tool life of the coated inserts pressed at room temperature was inferior to that of comparable commercial inserts, a normal wear pattern was established in turning AISI 4340 steel (300 BHN) at 150 ft./min. Microstructural studies of the coated pieces after testing proved them to be undersintered. Emphasis was therefore shifted to the hot-pressing method of densification. Hot pressing, involving the simultaneous application of heat and pressure to a coated or powder specimen, permits a marked reduction in heat-up time, time at sintering temperature, and cooling time; and generally results in lower porosity and less grain growth than is obtained in cold-pressed and sintered specimens. (Author)

AD-260 521 Div. 26, 12, 1
(3 Aug 61) OTS price $7.60

Chrysler Corp. Missiles Operations, Detroit, Mich.
DEVELOPMENT OF A ROTOR-WHEEL CONFIGURATION ORIENTED-WEDGE AIR LUBRICATED BEARING.
Interim technical documentary rept.,
by R. R. Gedeon. May 61, 74p. incl. illus. table (Rept. no. RL-R2)
(Contract AF 33(616)6614)
Unclassified report

DESCRIPTORS: *Gas bearings, Bearings, Design, Air, Lubrication, Theory, Hydrodynamics, Tests, Wedges, Gyroscopes, Configuration.

Design details and experimental and performance data are presented for 3 prototype oriented-wedge, hydrodynamic, air-lubricated bearings with potential application to the spin axis of a gyroscope. The 3-wedge double-phase bearing performed satisfactorily under a 10-g radial load at 11,500 rpm, and a 4.8-g thrust load at 18,000 rpm for a 2-lb rotor. It had better stability characteristics under both load and no-load conditions than the 2-wedge bearing. The 2-wedge, double-phase 60-degree tapered-end bearing performed satisfactorily under a 10-g radial load at 11,000 rpm, but thrust load could not be supported because of misalignment conditions of the tapered end covers; flat thrust ends appear to be more practical. The 2-wedge, inverted 60-degree bearing supported an 8-g thrust load at 18,000 rpm for a 2-lb rotor; radial loading could not be accomplished because of radial instability. Bearings with rotor l/d ratios of 1.0 or greater exhibit better radial operating performance than with small l/d ratios. The internal temperature rise of both 2- and 3-wedge double-phase bearings was about 15 F at 20,000 rpm.

AD-260 628 Div. 26, 17
(3 Aug 61) OTS price $11.50

Cincinnati Milling Machine Co., Ohio.
HIGH TEMPERATURE MACHINING METHODS.
Technical engineering rept. no. 5, 13 Apr 60-13 May 61, on Phase 2,
by J. L. Wennberg, C. L. Mehl and W. Pentland.
13 May 61, 157p. incl. illus. tables, 19 refs.
(Contract AF 33(600)40066)
(ASD TR 7-704, vol. 5) Unclassified report

DESCRIPTORS: *Machining, High temperature research, Milling machines, *Machine tools, Drilling machines, Heating, Heat resistant alloys, Materials, Lubricants, Electric arcs, Resistance, Nickel alloys, Cobalt alloys, *Cutting tools, Lathes, Steel, Stainless steel, Plasma physics, Electron beams.

Elevated temperature machining methods and heating techniques were developed to permit effective metal removal. Machinability of high strength steels, precipitation hardening stainless steels, nickel and cobalt based alloys and some refractory materials is improved at elevated temperatures. Tool life and permissible metal removal rates have been increased very significantly. Detrimental effects on materials can be minimized and are not severe. (Author)

AD-260 657 Div. 26, 17, 7
(4 Aug 61) OTS price $3.60

Republic Aviation Corp., Farmingdale, N. Y.
CAPACITOR DISCHARGE METAL FORMING.
Interim technical progress rept. no. 2, 3 Apr-3 July 61,
by J. Christiana, N. Inman and others. July 61,
39p. incl. illus.
(Contract AF 33(600)42920)
(AMC TR 7-844, vol. 2) Unclassified report

DESCRIPTORS: Sheets, Metals, *Manufacturing methods, Production, Guided missiles, Aircraft, Capacitors, *Electric discharges, *Electroforming, Airframes, Pressure, *Explosive forming, Circuits, Control, Coaxial cables, Underwater explosions, Shock waves, Deformation, Plasma physics, Hydrostatic pressure, Design.

Research was continued on capacitor discharge metal forming. The components and characteristics of a 155,000 joule (960 microfarad, 18,000 volt) capacitor storage system designed for capacitor discharge metal forming are described. The system consists of four groups of 39,000 joules each. One group has been installed and is under test. The remaining groups are being installed. First quarter maximum current in excess of 300,000 amperes at 20 kc frequency are obtainable with each group. (Author)

AD-260 686 Div. 26
(4 Aug 61) OTS price $10.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING (Svarka),
by G. A. Nikolayev, A. I. Akulov, and others.
25 Apr 61, 128p. incl. illus. tables (Trans. no. MCL-804)
Unclassified report

DESCRIPTORS: Machines, Machine tools, Industrial production, *Welding, Arc welding, Electron beams, Electric welding, Friction, Flame spraying, Plasma physics, Ultrasonics, Metals, Plastics, Quality control, Non-destructive testing, USSR.

A discussion is presented of the development of welding in the machinery and construction industries of USSR. Topics discussed are (1) electric arc welding equipment; (2) arc welding; (3) molten slag welding; (4) surfacing; (5) resistance welding; (6) gas flame treatment of metals; (7) new welding methods (friction, high frequency current, controlled atmospheres, electron beams, ultrasonics, and flame spraying (plasma jets), and plastics welding); (8) quality control (non-destructive testing, x-rays and gamma rays, ultrasonic, magnetic, and electrical methods); and (9) scientific research.

27. PROPULSION SYSTEMS

AD-260 034 Div. 27, 10
(24 July 61) OTS price $3.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
HAZARD CLASSIFICATION OF SOLID PROPELLANT GAS GENERATOR SM 65 (ATLAS),
by Joseph W. Holden. June 61, 33p. incl. illus. (Rept. no. OOY TR 61-23)

Unclassified report

DESCRIPTORS: Solid rocket propellants, *Gas generator engines, Hazards, Classification, Detonation, Tests, Storage, Fires, Handling, Transportation, Containers, Ignition.

Tests were conducted to obtain data which could be used to assign storage and ICC shipping classification to solid propellant gas generators used on Air Force SM 65 (Atlas) Missile. The gas generators were subjected to one cook-off test and four detonation tests for determining propagation. Gas generators of the type used in this test are a fire hazard rather than a detonation hazard. It is very doubtful that propagation or detonation will ever occur in shipping and handling due to accidents. A gas generator which accidentally functions in a shipping container will propel itself from the shipping container and will not propagate to adjacent generators in shipping containers. It is recommended that the solid propellant gas generators used with the MA-3 Engine, SM 65 (Atlas) and similar solid propellant gas generators be assigned ICC Class B, for shipping purposes; and be stored as Quantity-Distance Class 2 with Storage Compatibility Group B. (Author)

AD-260 042 Div. 27, 17, 26
(24 July 61) OTS price $9.10

Pratt and Whitney Aircraft, East Hartford, Conn.
RESEARCH AND DEVELOPMENT OF TITANIUM ROCKET MOTOR CASE.
Quarterly rept. no. 2, 1 Oct-31 Dec 60,
by R. P. Brody and Frank C. Crosby, Jr.
31 Jan 61, 104p. incl. illus. tables (Rept. no. PWA-1934)
(Contract DA 19-020-ORD-5230, Proj. TB4-004)
(WAL TR 766.2/2) Unclassified report

DESCRIPTORS: *Rocket cases, *Titanium alloys, Processing, Forging, Manufacturing methods, Aluminum alloys, Chromium alloys, Vanadium alloys, Heat treatment, Welding, Mechanical properties, Hydrogen embrittlement, Corrosion research, Microstructure, Fracture (Mechanics), X-ray diffraction analysis, Electric arcs, Electron beams, Welds, Deformation, Stresses, Sheets, Tensile properties.

The results of work on the development of a high strength, lightweight, Ti alloy rocket case, are reported. These results include (1) tensile tests, chemical analysis, and microexamination of a press-forged pancake forging; (2) techniques for hydrogenation of B-120VCA sheet stock; (3) fracture toughness and modified Charpy impact tests on flow-turned material, (4) x-ray diffraction studies of cold-rolled and flow-turned material; (5) tensile, bend, and fracture toughness tests of TIG and electron-beam welds; and (6) tensile tests of pancakes forged at high and low strain rates. (Author)

This report includes:
Manufacturing Labs., Inc., Cambridge, Mass.
PREFERRED ORIENTATION IN FLOW-TURNED B120VCA TITANIUM ALLOY SHEET, by S. V. Radcliffe and E. S. Meieran. Dec 60, 19p. incl. illus. (Subcontract to Pratt and Whitney Aircraft, East Hartford, Conn., Contract DA 19-020-ORD-5230)

AD-260 085 Div. 27
(26 July 61) OTS price $12.50

Airesearch Mfg. Co., Los Angeles, Calif.
INVESTIGATION OF VEIL COOLING FOR RADIAL-FLOW TURBINES,
by W. U. Rossler and J. W. Mitchell. May 61, 164p. incl. illus. tables, 19 refs. (Rept. no. K-451-R)
(Contract Nonr-284900; In cooperation with Stanford U., Calif.)

Unclassified report

DESCRIPTORS: *Gas turbines, Exhaust gases, Cooling, Thermocouples, Heat transfer, *Film cooling, Gas turbine disks, *Gas turbine rotors, Centrifugal compressors, Stainless steel, Slip rings, Calibration, Gas flow, Turbosuperchargers, Tests, Test methods, Test equipment, Infrared equipment, Heaters, Gas turbine nozzles, Rotating structures.

Results of an investigation into the behavior of veil (or film) cooling of a radial-inflow turbine are described. The study is concerned with the effect of introducing a thin film of cool gas between the main hot gas flow and the rotating turbine disk. The program was conducted in two parts. The first part, carried out by AiResearch Manufacturing Company, comprised an experimental study of the cooling phenomenon on an actual, hot, high-speed turbine. The second part, being conducted at Stanford University, comprises an analytical study and a model experimental study designed to measure basic heat transfer coefficients. The effectiveness of veil cooling was measured by means of thermocouples imbedded in the rotor, with readings brought out through a precision slip-ring unit. Tests were made with several film thicknesses and under various operating conditions. Correlations of the data are presented and discussed. The results of the Stanford work are reviewed. Analytical predictions of heat transfer to a rotating disk are given. The model experimental apparatus is described and plans for the concluding test work are discussed. (Author)

AD-260 144 Div. 27
(26 July 61) OTS price $3.60

Hiller Aircraft Corp., Palo Alto, Calif.
ANNULAR NOZZLE EJECTOR.
Summary rept. on Phase 2 Program,
by M. F. Gates and C. L. Cochran. Feb 61, 16p. incl. illus. (Rept. no. ARD-285)
(Contract Nonr-284000)

Unclassified report

DESCRIPTORS: Jet engines, *Thrust augmentor nozzles, Test equipment, Test methods, *Exhaust nozzles, Ground effect, Tests, Instrumentation, Calibration, Pressure, Temperature, Turbojet engines, Model tests, *Exhaust gas ejectors, Thrust, Calibration, Turbojet exhaust nozzles.

Work performed on the annular nozzle ejector is described. The full scale ejector assembly and

associated equipment was fabricated. Tests indicated that its augmentation performance was approximately 5 points less than that of the small scale hardware. The jet wake data in combination with jet area distribution indicated the discrepancy between full scale and small scale results may have been caused by less effective ejector action due to the non-uniform momentum curtain. The ejector wake data indicates roughly an order of magnitude reduction in wake total pressure and temperature from the unaugmented turbojet. Ground effect tests were conducted with the small scale model. This model geometrically represents the full scale hardware. These tests indicated that an augmentation reduction of approximately 15 points could be anticipated at a ground clearance of 0.35 diameters. The decrease in performance began at approximately 1.3 diameters. Blockage of the secondary flow passages improved performance only below 0.10 diameters ground clearance. Above that level the best performance was obtained by permitting secondary pumping to continue. (Author)

AD-260 184 Div. 27, 17, 14
(26 July 61) OTS price $7.60

Ordnance Materials Research Office, Watertown, Mass.
A REVIEW OF MATERIALS RESEARCH FOR 1960 OF THE ORDNANCE MATERIALS RESEARCH OFFICE AND THE D.O.D. LARGE SOLID PROPELLANT ROCKET MOTOR MATERIALS PROGRAM,
ed. by Irving Kahn and Frank S. Hodi. June 61, 76p. 170 refs. (OMRO pub. no. 20)
Unclassified report

DESCRIPTORS: *Rocket motors, *Rocket cases, Rocket motor nozzles, *Metals, *Alloys, Powder metals, Powder alloys, *Heat resistant alloys, *Heat resistant polymers, Plastics, Ceramic materials, *Refractory materials, *Adhesives, *Resin adhesives, Plating, Welding, Packaging, Coatings, Armor plate, Test methods, Non-destructive testing, Materials, Solid state physics, Scientific reports, Corrosion research.

Contents:
Adhesives
Analysis and measurement
Cleaning, preserving materials and fungus studies
Coatings, inorganic
Coatings, organic
Corrosion studies
Metals
  Ferrous
  Nonferrous
High temperature materials
Nondestructive tests
Packaging
Physics, solid state
Plastics
Rubber
Welding
Rocket motor materials program

AD-260 531 Div. 27, 12, 26
(2 Aug 61) OTS price $1.10

General Electric Co., Cincinnati, Ohio.
THE DEVELOPMENT OF ROLL FORMED TUNGSTEN NOZZLE LINERS TO THE ASYMMETRIC POLARIS A-3 FIRST STAGE DESIGN,
by J. E. Japka. 14 June 61, 3p. incl. illus.
(Rept. no. DM 61-200)
(Contract NOw 61-0161-c)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Rocket motors, Manufacturing methods, Steel, Tungsten, Metal plates, Sheets, *Conical nozzles, Machine tools, Production, Design.

The objective of this work is the development of an asymmetric roll formed W nozzle liner for the Polaris A-3 first stage. The process involved in making the parts consists of hot roll forming W plates to 60 degree and then 30 degree included angle truncated cone shapes, followed by hot power spinning the cones to the asymmetrical shape. A unique piece of equipment will make it possible to program the spinning of this eccentric shape; this involves an hydraulic tracing mechanism following a template. Development work will be done first with mild steel and then with W. One end of the nozzle will be flanged and the liner cut free from the spun shape. The finished part will be pickled and electropolished. Tooling consists of a forming mandrel, a spinning mandrel, and a revolving tracing template.

AD-260 535 Div. 27, 14
(2 Aug 61) OTS price $1.60

General Electric Co., Cincinnati, Ohio.
FABRICATION OF PYROLYTIC GRAPHITE ROCKET NOZZLE COMPONENTS.
Monthly progress rept. for May 61,
by R. E. Viventi. 14 June 61, 9p. (Rept. no. DM 61-201)
(Contract NOw 61-0161-c)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Rocket motors, *Graphite, Refractory materials, Refractory coatings, Coatings, Thickness, Pyrolysis, Manufacturing methods, Production, Design.

The difficulty in producing subscale test nozzle inserts with a high thickness/radius of curvature ratio has been bypassed by redesigning the inserts to incorporate a 0.100-in. liner thickness instead of the 0.150 in. thickness originally required. The emphasis on free standing pyrolytic graphite liners with suitable backup materials promises to increase the reliability of nozzle inserts during firing although the problems encountered in finish machining have increased substantially. Conseqently the ratio of parts shipped to liners fabricated has been reduced. Effort is being made to decrease the scrap rate through improved machining techniques. (Author)

AD-260 543 Div. 27, 9
(2 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL INVESTIGATION OF AN AIR-COOLED TURBINE OPERATING IN A TURBOJET ENGINE AT TURBINE INLET TEMPERATURES UP TO 2500 F,
by Reeves P. Cochran and Robert P. Dengler. July 61, 47p. incl. illus. tables, 25 refs.
(Technical note no. D-1046)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA technical note D-1046.

DESCRIPTORS: *Turbojet engines, *Gas turbine blades, *Gas turbines, Tests, Cooling, Effectiveness, Combustion chambers, Air cooled.

An air-cooled turbine with corrugated-insert type stator and rotor blades was operated in a modified production-model engine. Results

indicated that operation of turbojet engines at turbine inlet temperatures up to 2500 F appears to be feasible. Combustors and turbine stator blades, in addition to turbine rotor blades, were critical components at these temperature levels. An average chordwise rotor blade temperature of 1300 F was maintained with a coolant-to-gas weight-flow ratio of about 0.022 when the average turbine inlet temperature was 2500 F and coolant inlet temperature was about 260 F. Leading-edge tip caps on the rotor blades improved the cooling of the leading-edge region. (Author)

AD-260 590 Div. 27
(3 Aug 61) OTS price $2.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DEVELOPMENT OF ION PROPELLANT SYSTEM.
Quarterly technical progress rept. no. 5, 15 Mar-15 June 61,
by D. R. Snoke and P. J. Lawlor. 26 June 61, 27p. incl. illus. (Rept. no. ER-4487)
(Contract AF 33(616)7219, Proj. 3084)
Unclassified report

DESCRIPTORS: *Ion rockets, *Electric propulsion, *Rocket propulsion, *Rocket propellants, *Cesium, Liquid metals, Liquid metal pumps, Fuel pumps, Pumps, Fuel systems, Vapors, Gas flow, Measurement, Instrumentation, Test equipment, Tests, Storage, Rocket motors, Design.

The prototype system was tested for endurance capabilities with Ce. System runs made intermittently amounted to 44 hrs. Oxide reaction effects were apparent on inspection of the vaporizer; the discharge pores were sealed by a layer of reacted Ce salts. A substitute vaporizer was installed. Approximately 1.75 lb of Ce were transferred from the prototype storage tank 3 weeks after completion of the endurance testing; visual inspection indicated no reaction. A method of analyzing system response and operation characteristics with a low flow metering device for liquid Ce is discussed. A calibrated orifice system was proposed; flow rates will cover the range from 10 to the -5th power to 10 to the -7th power lb per sec.

AD-260 691 Div. 27, 17, 26
(7 Aug 61) OTS price $1.10

Rolla Metallurgy Research Center, Bureau of Mines, Mo.
VAPOR DEPOSITION OF TUNGSTEN ON ROCKET NOZZLE INSERTS.
Summary rept. for period ending 30 June 61,
by F. W. Hoertel. 30 June 61, 8p. incl. table.
(Sponsored by the Department of the Navy)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Vapor plating, *Metal coatings, *Tungsten, Graphite, Beryllium compounds, Oxides, Rhenium, Refractory materials, Coatings, Fracture (Mechanics), Microstructure.

Six graphite nozzle inserts, 3 with a coating of Re, were coated with W. The most drastic effects encountered during firing tests of the inserts were attributed to the high ignition pressure which resulted from the small throat diameter (0.423 in.). Microscopical examination of a cross section of a coated mock-up insert showed an adherent, mechanical bond between the graphite and the W. One of the W-coated nozzles with a Re barrier layer was sectioned and examined metallurgically. The macrostructure of the sectioned insert revealed 1 fracture, transverse to the W deposit, near the center of the nozzle. The microstructure indicated no alloying of the W with the Re. Spectrographic analysis of the W showed trace contaminations of Fe, Mn, Mo, Ni, Si, and Cu. Three beryllia inserts and 1 beryllia-W insert were coated with W. Transverse cracks appeared in the substrates of the W-coated beryllia nozzle. No cracks appeared in the W-coated nozzle with the beryllia-W substrate.

AD-260 728 Div. 27, 17
(8 Aug 61) OTS price $11.50

Budd Co., Philadelphia, Pa.
DEVELOPMENT OF HIGH PERFORMANCE ROCKET MOTOR CASE.
Quarterly technical progress rept. no. 12, 1 Apr-30 June 61,
by R. C. Dethloff. 30 June 61, 146p. incl. illus.
(Contract DA 36-034-ORD-3296)
Unclassified report

DESCRIPTORS: *Rocket motors, Rocket cases, Materials, *Welded joints, Welding, Design, *Steel, Heat treatment, Mechanical properties, Tensile properties, *Corrosion resistant alloys, *Stainless steel, Electron beams, Spot welds, Fracture (Mechanics), Titanium alloys, Explosive forming, Tests, Test methods.

The evaluation of material for possible application to rocket motor cases was continued. Data on Ti-13V-11Cr-3Al alloy are included. Data on fracture energy testing and retests of stress corrosion specimens without edge seal protection are reported on JLS 300 alloy. Retesting of the initial heats of 20 and 25% Ni steels incorporating modified heat treatments to improve mechanical properties was accomplished. Results of tensile tests on AM 359 material are reported. Results of testing of uniaxial weld joint specimens of AM 355-PH 15-7 Mo material, utilizing a combination of resistance and fusion welding, are included. Work on uniaxial fusion welded butt joints with W inert arc and electron beam processes was continued. (Author)

AD-260 760 Div. 27, 25
(7 Aug 61) OTS price $2.00

National Aeronautics and Space Administration, Washington, D. C.
THEORETICAL PERFORMANCE OF REVERSE-FEED CESIUM ION ENGINES,
by J. Howard Childs. Aug 61, 80p. incl. illus.
(NASA TN-D-876)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA TN-D-876.

DESCRIPTORS: *Ion rockets, Electric propulsion, Ions, *Cesium, Tungsten, Porous materials, Electrodes, Vapors, Superaerodynamics, Ionization.

A theoretical analysis of reverse-feed cesium ion engines indicates the values required for the various engine dimensions in order to optimize performance, and the conditions under which this type engine is of interest for space missions. A comparison with the theoretical performance of porous-tungsten ion engines is included. The

reverse-feed ion engine may possibly give higher power efficiencies at low specific impulse. Charge exchange will result in greater electrode erosion in this type engine, necessitating a mechanically complex system for replacement of electrodes. The weight of electrode material consumed will be small relative to the propellant weight. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-260 101 Div. 28, 6, 8
(25 July 61) OTS price $1.60

Human Engineering Lab., Aberdeen Proving Ground, Md.
RELATIONSHIP BETWEEN GALVANIC SKIN RESISTANCE AND REACTION TIME ON A VISUAL MONITORING TASK, by Robert Karsh and Claude D. Patton. May 61, 11p. incl. illus. tables (Technical memo. no. 8-61)
(Proj. TB1-1000)
Unclassified report

DESCRIPTORS: *Galvanic skin response, Resistance, Reaction time, Vision, Visual signals, Measurement, Closed cycle ecological systems, Detection, *Human engineering, Effectiveness, Cathode ray tube screens.

Relationships between 5 indices of galvanic skin resistance and 3 indices of reaction time obtained during a visual monitoring task were investigated. Thirty-nine untrained enlisted men monitored a cathode ray tube screen for a 1-hour period in an isolated environment. Observers were required to detect 25 critical signals which differed from a periodically blinking background signal only by a larger amplitude. Performance was measured by reaction time. Continuous measures of galvanic skin resistance were obtained. Interrelationships among galvanic skin resistance indices as well as mean reaction time changes over time were consistent with earlier reports on these variables. No significant relationships were found between indices of galvanic skin resistance and reaction time, between or within observers. Extreme individual variation of both variables was observed. (Author)

AD-260 104 Div. 28
(25 July 61) OTS price $5.60

Group Effectiveness Research Lab., U. of Illinois, Urbana.
HYPNOTICALLY INDUCED LEADER ATTITUDES AND GROUP CREATIVITY.
Rept. on Interpersonal Perception and Personality Assessment,
by Fred E. Fiedler, Perry London and Robert S. Nemo. May 61, 51p. incl. tables, 17 refs.
(Technical rept. no. 11)
(Public Health Service Grant M-1774)
Unclassified report

DESCRIPTORS: *Leadership, Attitudes, Group dynamics, Perception, Behavior, Reaction (Psychology).

The effects of leader attitudes on group creativity were investigated with hypnosis as the medium for manipulating attitudes. The contribution of hypnotic susceptibility to the manipulation of leader attitudes and behavior was examined by subjecting very susceptible and unsusceptible subjects (S's) to identical experimental treatments. Twenty-four female S's, half of whom scored in the upper and half in the lower third of the Stanford Hypnotic Susceptibility Scale, were subjected to the three experimental conditions. The data were analyzed in terms of ratings which S made of hypothetical co-workers, ratings which all group members made of the group atmosphere, ratings confederates made of S, indices of group creativity, and analysis of the verbatim transcripts of the group sessions. The results demonstrated few significant differences between susceptible and unsusceptible S's. Hypnosis had a moderate influence on S's attitudes towards co-workers, which in turn produced a number of subtle variations in her group behavior under different sets.

AD-260 131 Div. 28, 16
(25 July 61) OTS price $.75

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
SPEED AND ACCURACY OF POSITIONING WEIGHTLESS OBJECTS AS A FUNCTION OF MASS, DISTANCE, AND DIRECTION.
Rept. on Human Factors in Advanced Flight, by William N. Kama. Mar 61, 19p. incl. illus. tables.
(Proj. 7184)
(WADD TR 61-182) Unclassified report

DESCRIPTORS: *Positioning reactions, *Weightlessness, Reaction (Psychology), Velocity, Human engineering, Man, Errors, Conditioned reflex, Stimulation.

Human performance in positioning weightless objects was investigated experimentally using an air-bearing frictionless table. The subjects moved each four masses (1000, 3000, 5000, and 7000 gram) various distances (10,20, and 40 cm) in each of two directions over this frictionless table in response to paired light stimuli. The responses were accomplished in complete darkness after the lights were extinguished. Results were analyzed in terms of constant and absolute errors of positioning, and response time. From the investigation, we concluded that: (1) Mass has little effect on the accuracy of positioning. There is some evidence, however, that response time increases with increase in mass. (2) Distance is a significant variable affecting the direction of error, accuracy, and speed of positioning responses. Response time increases, and accuracy decreases with distance. (3) Direction of movement is a significant variable affecting constant error, absolute error, and speed of positioning responses. Subjects tend to undershoot the mark in near to far movements. (Author)

AD-260 165 Div. 28
(25 July 61) OTS price $1.60

Group Effectiveness Research Lab., U. of Illinois, Urbana.
THE LEADER'S PERCEPTION OF CO-WORKERS, GROUP CLIMATE, AND GROUP CREATIVITY: A CROSS VALIDATION,
by Fred E. Fiedler, Alan R. Bass and Judith M. Fiedler. May 61, 14p. incl. tables (Technical rept. no. 1)
(Contract Nonr-183436)
Unclassified report

DESCRIPTORS: *Leadership, *Group dynamics, Attitudes, Behavior, Social communication, *Perception, Reaction (Psychology), Emotions.

The major significance of the present investigation is in the cross-validation of the previous sets of findings. Previous studies have shown that the leader's esteem for his least-perferred co-workers correlated positively with group creativity when the leader perceived the group as pleasant. This same relationship was negative when the leader experienced the group as unpleasant and stressful. Findings indicate that group creativity is the resultant of complexly interacting social processes. The same leadership attitudes and techniques are not maximally effective in all situations; the stressful group requires a firm hand while the performance of relaxed and pleasant groups suffers under the same treatment. Just as the good field general is often a poor garrison commander, so does the task-oriented leader seem to be most successful in creative groups which he experiences as being in a state of stress or crisis. The permissive, emotionally outgoing leader is most successful in a relaxed and easygoing group climate. (Author)

AD-260 166 Div. 28, 15
(26 July 61) OTS price $2.60

Illinois U., Urbana.
SOME PROPERTIES OF THE D2-STATISTIC.
Rept. on Interpersonal Perception and Interpersonal Relationships in Therapeutic Counseling, by Rolfe LaForge. 1 July 61, 19p. 17 refs.
(Separate technical rept. no. 2)
(Contract Nonr-183411)
Unclassified report

DESCRIPTORS: *Psychotherapy, Statistical analysis, Perception, *Psychometrics, Fractionation, Mathematical analysis, Personality.

AD-260 312 Div. 28
(28 July 61) OTS price $5.60

Psychological Service of Pittsburgh, Pa.
A THEORY OF MOTIVATION.
Technical rept.,
by Ray C. Hackman and Dale W. Dysinger. June 61, 38p. incl. tables.
(Contract Nonr-281000)
Unclassified report

DESCRIPTORS: *Needs, Theory, Test methods, Behavior.

AD-260 445 Div. 28, 6, 30
(2 Aug 61) OTS price $4.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
A HUMAN ENGINEERING CHECK LIST,
by William H. McAbee, June 61, 50p. (Rept. no. APGC TN 61-25)
Unclassified report

DESCRIPTORS: *Human engineering, Effectiveness, *Radar equipment, Personnel, Maintenance, Instrumentation, Operation, Anthropometry, Safety, Design, Aircraft equipment, Airborne, *Ground support equipment, Control systems, Display systems.

This human engineering check list is a by-product of APGC Project 1978Y1-2, Frequency Diversity Radar Tests (Category I-II, AN/FPS-24 and AN/FPS-27 Radars). A majority of the 287 human engineering items listed herein were prepared and used by the author in conjunction with a human factors study of the anti-jamming console of two FD Radars (AN/FPS-24-27) in September 1960. Although this human engineering check list was designed primarily for ground radar equipment, many of the listed items will be of use to developers and evaluators of airborne equipment. Documentation of this check list was accomplished to provide engineers and development personnel a human factors index for the development of equipment. This list includes the areas of maintenance, safety, anthropometry, environment, displays, controls, instrumentation grouping, and operations. (Author)

AD-260 505 Div. 28, 30
(31 July 61) OTS price $1.60

Operational Applications Office, Air Force Electronic Systems Div., Bedford, Mass.
PLANS FOR MAN-COMPUTER COMMUNICATIONS RESEARCH USING THE RELIABILITY TEST ASSEMBLY COMPUTER AND THE ADVANCED DISPLAY CONSOLE AS RESEARCH TOOLS.
June 61, 11p.
(ESD TN 61-59) Unclassified report

DESCRIPTORS: *Human engineering, Computers, Communications theory, Test equipment, *Display systems, *Data processing systems, Reliability, Tests.

The advanced display console and RTA Computer developed under SAGE II contracts will be modified for use in man-machine communications experiments. Man-machine communication procedure will be studied in five aspects; (1) preparation of data to make up visual messages, (2) presentation of the messages, (3) retrieval of data not already displayed, (4) choice behavior of the man, and (5) processing of the man's output. Present scheduling indicates full availability of the equipment for communications experiments by 1 February 1962. (Author)

AD-260 528 Div. 28
(3 Aug 61) OTS price $6.60

Operational Application Office, Air Force Electronic Systems Div., Bedford, Mass.
MAN-MACHINE SYSTEM PERFORMANCE CRITERIA,
by Anne W. Story. May 61, 61p. 23 refs.
(ESD TR 61-2) Unclassified report

DESCRIPTORS: *Human engineering, Standards, Classification, Test methods, Operations research.

Four categories of criteria are developed for the evaluation of man-machine system performance. The applicability of these criteria during system design, building, and testing is discussed. Some illustrative evaluations of man-machine systems are surveyed. Problems that accrue through the use of simulative features in the assessment of system performance are considered. (Author)

Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

AD-260 556 Div. 28, 16
(2 Aug 61) OTS price $2.60

Ohio State U. Research Foundation, Columbus.
INTELLIGIBILITY AND CONFUSABILITY OF VOWELS AND DIPHTHONGS UNDER VARIOUS CONDITIONS OF QUIET AND NOISE,
by Henry M. Moser, John F. Michel, and Wallace C. Fotheringham. Mar 61, 19p. incl. illus. tables, 17 refs. (Technical rept. no. 60)
(Contract AF 19(604)6179)
(AFCCDD TN 61-33) Unclassified report

DESCRIPTORS: *Vocabulary, *Intelligibility, *Language, Noise, Voice communication systems, *Speech, Signal to noise ratio, Speech transmission, Tests, Communications theory, Perception, *Psychoacoustics, *Auditory perception.

Sixteen English vowels and diphthongs were recorded by 4 male and 4 female speakers. For each vowel and diphthong, 120 responses were obtained from a panel of 6 phonetically trained listeners at several levels of noise and quiet; each of 5 levels of noise were matched for listening difficulty with 5 levels of quiet. The levels of difficulty ranged from approximately 25 to 85% correct. The results on vowel-diphthong intelligibility support the conclusions that vowels and diphthongs (1) are significantly different in intelligibility; (2) have a fairly stable order of intelligibility, similar in noise and quiet and among the eight speakers, though more stable among speakers of the same sex; (3) improve inintelligibility at different rates as listening conditions are improved; and (4) are more intelligible from male speakers. In regard to vowel and diphthong confusability, results support the conclusions that (1) a great many significant confusions exist among the vowels and diphthongs under fairly difficult listening conditions, (2) at least one significant confusion exists for each vowel and diphthong, (3) each vowel and diphthong is a significant confusion for at least one other vowel or diphthong, and (4) confusions bear a reciprocal relationship to one another. (Author)

AD-260 557 Div. 28, 5, 16
(2 Aug 61) OTS price $4.60

Ohio State U. Research Foundation, Columbus.
INFLUENCE OF CONSONANTS ON THE RECOGNITION OF THE VOWELS (u) AND (i). A STUDY OF INTERNATIONAL PRONUNCIATIONS FOR TWO AND THREE,
by Henry M. Moser and Harvey J. Gardner. May 61 39p. incl. illus. tables (Technical rept. no. 63)
(Contract AF 19(604)6179)
(AFESD TN 61-38) Unclassified report

DESCRIPTORS: *Speech, *Language, Analysis of variance, Stimulation, Sound, Pitch discrimination, Signal to noise ratio, *Intelligibility, Speech transmission, Noise, Communication theory, Errors.

The purpose of this study was to investigate a methodology proposed to solve the auditory confusion between the vowels (u) and (i). This methodology utilizes the different influences exerted by consonants on recognition of the adjacent vowel, and the effects of foreign dialect on these influences. It was hoped that the results would provide alternative pronunciations of superior intelligibility for the numbers TWO and THREE. (Author)

AD-260 558 Div. 28, 5, 16
(2 Aug 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
THE RECOGNITION OF FRENCH VOWELS BY AMERICAN LISTENERS,
by Henry M. Moser and Pierre Leon. Mar 61, 10p. incl. illus. tables (Technical rept. no. 61)
(Contract AF 19 (604)6179)
(AFCCDD TN 61-42) Unclassified report

DESCRIPTORS: *Intelligibility, Communication theory, *Language, Stimulation, Sound, *Hearing, *Speech transmission, *Speech.

This study was concerned with the effect of French accent on the intelligibility of English one-syllable words for American listeners. The French accent was artificially created by substituting most nearly equivalent French vowel sounds in English words. Orthographic problems of misspelling were eliminated. Listeners were American university students selected from the Central States region of the United States. The results indicate: (1) when substitution of sounds occurs because of a French accent, a loss of comprehension is to be expected; (2) sounds of one language cannot be presumed to be equivalent to those of another language; (3) certain errors can be predicted when the French phonetic pattern is substituted for English; and (4) single vowels are less intelligible than diphthongs pronounced as separate sounds. (Author)

AD-260 674 Div. 28
(4 Aug 61) OTS price $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
THE LAW OF CRITICALITY,
by Marshall B. Jones and Paul D. Nelson. 1960, 18p. incl. illus. tables. (Proj. no. MR005.13-5001, rept. no. 7)
Unclassified report

DESCRIPTORS: Psychology, *Group dynamics, *Attitudes, *Naval personnel, Naval aviation, Sociometrics, *Psychometrics, *Verbal behavior, Factor analysis.

In a series of studies naval aviation cadets were grouped in pairs and obliged to discuss at length the pros and cons of a stated thesis. In general, discussion had the effect increasing the level of disagreement with the thesis. If the cadets started out agreeing with the thesis, they endorsed it less heartily following discussion; and if they started out disagreeing with it, they rejected it still more strongly after they had discussed it. This rule did not hold for all persons or for all issues, but for most issues and most persons it did. (Author)

AD-260 675 Div. 28
(4 Aug 61) OTS price $1.60

Illinois U., Urbana.
FINAL REPORT ON RESEARCH GRANT FOR SYMPOSIUM ON THE ORGANIZATION OF MULTIVARIATE EXPERIMENT IN THE BEHAVIORAL SCIENCES,
by Raymond B. Cattell. 31 July 61, 11p.
(Grant Nonr (G)-0008-60, Proj. NR 154-221)
Unclassified report

DESCRIPTORS: Behavior, *Psychology, *Conferences.

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-260 229 Div. 29
(27 July 61) OTS price $1.60

Illinois U., Urbana.
DEVELOPMENT OF TECHNIQUES FOR THE OBJECTIVE DESCRIPTION OF FREEZE DEHYDRATED COOKED BEEF.
Rept. no. 9 (Final). 15 Dec 58-14 Dec 60,
by M. P. Steinberg. 14 Dec 60, 15p.
(Contract DA 19-129-qm-1332, Proj. 7-84-06-032)
Unclassified report

DESCRIPTORS: *Freeze drying, Dehydration, *Beef, Iron compounds, Cyanides, Storage, Temperature, Taste, Determination, Heating, Test methods, Biochemical tests, Acceptability, Water, Absorption.

The sedimentation value determination was found to be significantly related to tenderness of beef. Ferricyanide reducing power was positively correlated with subjective flavor and off-flavor. Volatile carbonyl content was found to increase with storage. The initial improvement in flavor and off-flavor scores with storage at 100 F. is discussed. (Author)

AD-260 795 Div. 29
(26 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF ARMORED FIGHTING VEHICLE CLOTHING (CANADIAN).
16 June 61, 6p. (Proj. no. ATB 2-111)
Unclassified report

DESCRIPTORS: *Clothing, Arctic regions, Armored vehicles, Military requirements, Canada, Tests, Military personnel.

30. RESEARCH AND RESEARCH EQUIPMENT

AD-260 008 Div. 30, 31
(20 July 61) OTS price $1.00

Naval Research Lab., Washington, D. C.
NAVY HIGH-IMPACT SHOCK MACHINES FOR LIGHTWEIGHT AND MEDIUMWEIGHT EQUIPMENT.
Interim rept.,
by I. Vigness. 1 June 61, 37p. incl. illus.
30 refs. (NRL rept. no. 5618)
Unclassified report

DESCRIPTORS: *Laboratory equipment, *Impact shock, Test equipment, *Test facilities, Test methods, Naval equipment, Motion, Analysis, Velocity, Acceleration, Simulation, Design.

Descriptions are given of the Navy HI shock machines for light- and medium-weight equipment. Shock motions are given for standard loading conditions. These are illustrated by acceleration-, velocity-, and displacement-time relations. Maximum values of velocities and displacements, and of accelerations passed by various low-pass filters, are presented. Shock spectra are presented for selected conditions. Equivalent displacement- and velocity-shock, together with maximum values of acceleration, can be established for their respective effective frequency ranges from observations of the shock spectra. Concepts relative to the specification of shock tests are considered. These include brief considerations of analyses of shock motions, methods of specifying a shock test, and what is meant by simulation of field conditions. (Author)

AD-260 016 Div. 30, 20
(21 July 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
TWO INSTRUMENTS FOR MEASURING DISTRIBUTIONS OF LOW-ENERGY CHARGED PARTICLES IN SPACE,
by Michel Bader, Thomas B. Fryer, and Fred C. Witteborn. July 61, 42p. incl. illus. (NASA Technical note D-1035)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-1035.

DESCRIPTORS: Spaceships, *Instrumentation, Particles, *Protons, Density, Measurement, Plasma physics, *Interstellar matter, Solar cells, Distribution, Recording devices.

Current estimates indicate that the bulk of interplanetary gas consists of protons with energies between 0 and 20 kev and concentrations of 1 to 10 to the 5th power particles per cc. Methods and instrumentation for measuring the energy and density distribution of such a gas are considered from the standpoint of suitability for space vehicle payloads. It is concluded that electrostatic analysis of the energy distribution can provide sufficient information in initial experiments. Several instruments designed for space plasma measurements and the methods of calibration and data reduction are described. The instrument designed for operation on solar cell power has the following characteristics: weight, 1.1 pounds; size, 2 by 3 by 4 inches; and power consumption, 145 mw. The instrument is designed to yield information on the concentration, energy distribution, and the anisotropy of ion trajectories in the 0.2 to 20 kev range. (Author)

AD-260 022 Div. 30
(26 July 61) OTS price $1.10

Washington U., Seattle.
AN ANALYTIC ITERATIVE ROTATION PROGRAM FOR THE

IBM TYPE 709,
by George Burket. July 61, 4p.
(Contract Nonr-47708)

Unclassified report

DESCRIPTORS: *Computers, Data processing systems, Programming, Coding, Mathematical computer data, *Mathematical logic, Scheduling.

This program performs an orthogonal rotation of an arbitrary factor loading matrix with the criterion that the variance of the squared factor loadings be a maximum for each successive simple structure approximation vector. The method is essentially the same as that used in an IBM Type 650 program reported earlier (Horst, et. al., 1958). The major computational difference between this program and the earlier one is that here the input factor loading matrix is normalized by rows before rotation. Input to the program may consist either of a BCD tape produced from cards off-line or a labelled FORTRAN binary tape such as that produced by an existing factor analysis program (Nussbaum, et. al., 1961). Output is from tape to printer. A binary tape containing transformation vectors and simple structure approximation vectors may optionally be written. This option was provided to facilitate the use of this program's output as input to some other program. There are 766 cards in the symbolic deck and 56 cards in the relocatable column binary deck. The program was coded in FAP for use with the FORTRAN Monitor System. It incorporates a SHARE fixed-point square root subroutine (IB SQR, SHARE dist. #507) as well as a modified version (Nussbaum, 1961) of a SHARE conversion subroutine (IB CBB, SHARE dist. 748). (Author)

AD-260 059 Div. 30, 12, 1, 8
(21 July 61) OTS price $10.50

Rand Corp., Santa Monica, Calif.
AN OMNIBUS OF BRIEFING PAPERS ON ANALYSIS OF AUTOMATIC CHECKOUT EQUIPMENT AND AIDS TO ITS DESIGN,
by S. I. Firstman, A. A. Barbour, and others,
12 June 61. 132p. incl. illus. tables (Research memo. no. RM-2750)
(Contract AF 49(638)700)

Unclassified report

DESCRIPTORS: Automatic, Test equipment, Test methods, *Test sets, *Ground support equipment, Air force operations, Maintenance, *Maintenance equipment, Costs, *Guided missiles, *Aircraft, Human engineering, Standardization, Air force logistics, Air force supplies.

Contents:
Automatic checkout equipment: a summary report of RAND's study
Basic considerations of automatic testing
Economic-physical trade-offs in missile system design for readiness
Readiness testing design criteria
Ballistic missile prelaunch checkout
Rules for effective automatic fault location
Weapon system cost implications of automatic checkout equipment and the pros and cons of its standardization
Manpower implications of test automation
Human factors considerations in the design of automated checkout equipment
Automatic checkout equipment--its implications for data system design

AD-260 069 Div. 30
(24 July 61) OTS price $1.10

Unit Process Assemblies, Inc., Woodside, N. Y.
DERMITRON THICKNESS TESTER EQUIPPED WITH SPECIAL PROBE SYSTEM TO MEASURE THICKNESS OF CHROMIUM PLATE IN CALIBER 0.30 GUN BARRELS.
Final rept.
May 61, 8p. incl. illus.
(Contract DA 30-069-ORD-2797)

Unclassified report

DESCRIPTORS: *Gages, Thickness, Measurement, Design, Test equipment, Electronic equipment, Gun barrels.

The purpose of this program was to modify, improve and fabricate a Dermitron gauge for measuring the thickness of chromium in caliber 0.30 gun barrels, based on a prototype developed by the National Bureau of Standards. The NBS prototype gage proved the feasibility of measurements in the 0.30 caliber bore. However a redesign was required in order to make this gage suitable for production inspection conditions. Features of the new design, which represent improvements over the prototype, are described. (Author)

AD-260 073 Div. 30, 24
(24 July 61) OTS price $6.60

Xerox Corp., Rochester, N. Y.
THE DEVELOPMENT OF A MINICARD VIEWER PROCESSOR MX-1993 (XW-1)/G.
Final engineering rept.
1 June 61, 70p. incl. illus. tables.
(Contract AF 30(602)1523)
(RADC TR 61-128)

Unclassified report

DESCRIPTORS: *Data processing systems, Design, Optical systems, Printing, Data storage systems, Test equipment, Operation, *Reading machines.

A proprietary device, to be known as the 914 Office Copier, was developed. A modified design of this unit provided the print-out portion of the contract machine. Minicard-handling techniques developed by the Eastman Kodak Company were adapted and tailored to the needs of the developmental machine. An optical system was conceived and constructed, using bench-test technique with mock-ups. Various light sources were tested in the viewing-projection system and a compromise selection was made on the basis of stability, light intensity, and generated heat. A system of scan exposure of the Minicard was developed, involving synchronized scanning of a Minicard with enlargement exposure on a revolving xerographic drum. The optical system was arranged to provide visual inspection by the operator of the 12 documents on the Minicard, enlarged 60 times on a translucent viewing screen. Rapid selection of documents was provided by a single 12-position switch and print-out of any slected document by a push-button switch. Only one control was made manual and it was equipped with positive positioning detents to avoid a requirement for a high degree of operator skill or dexterity. (Author)

AD-260 117 Div. 30
(25 July 61) OTS price $8.10

Computer Techniques Lab., Stanford Research Inst., Menlo Park, Calif.
FUNDAMENTAL INVESTIGATION OF DIGITAL COMPUTER STORAGE AND ACCESS TECHNIQUES.

Rept. for 1 Apr 60-1 Apr 61,
by S. W. Miller. May 61, 90p. incl. illus.
112 refs.
(Contract AF 30(602)2227, Proj. 4027)
(RADC TR 61-117A) Unclassified report

DESCRIPTORS: *Digital computers, *Memory devices, *Data storage systems, Switching circuits, Magnetic cores, Ferroelectricity, Capacitors, Negative resistance circuits, Delay lines, Photography, Superconductivity, Costs, Magnetic tape, Magnetic core switches.

The artifice of a conceptual model of a storage unit was used in order to classify the various kinds of storage units according to their terminal characteristics. The important terminal characteristics are the storage capacity, speed and order of access, the operating mode, and the permanence of the stored data. This model was dissected into four fundamental parts, an aggregate of storage registers, access equipment for selection and excitation of the desired register, the sensing equipment for determining the data stored in the register, and the organizational scheme used for their interconnection. The various techniques for achieving these fundamental operations, either in use or being developed, are outlined and discussed. The relation between the use of particular techniques in a storage unit and the position of that storage unit on the capacity vs speed graph is shown with some predictions for improvements. (Author)

AD-260 118 Div. 30
(25 July 61) OTS price $17.00

Computer Techniques Lab., Stanford Research Inst., Menlo Park, Calif.
MAGNETIC CORE ACCESS SWITCHES,
by John L. Haynes and Robert C. Minnick. May 61, 264p. incl. illus. tables, 52 refs.
(Contract AF 30(602)2227, Proj. 4027)
(RADC TR 61-117B, Technical suppl. to RADC TR 61-117A, AD-260 117) Unclassified report

DESCRIPTORS: *Digital computers, *Memory devices, *Data storage systems, Switching circuits, Electronic switches, Magnetic cores, Design, Mathematical analysis, Algebra, Matrix algebra, *Magnetic core switches.

A number of the more commonly known magnetic core acess switches are combined in a single analytical model. In addition to yielding as special cases the known acess switches on which it is based, this model produces many apparently new switches. Relationships among the various parameters in this model are developed in such a way that the designer may choose the number of drivers, the load-sharing factor, the number of turns of wire per switch core and the magnitude of the maximum disturbing magnetomotive force within certain limits. As further aids to the designer, a number of tables are included and algorithms are given which may be used to match the switch properties closely to the design requirements. Several methods are developed for economizing on the number of drivers used in switches, and certain special access switches are treated. The current knowledge is reviewed on a fairly recent and important class of access switches, known as load-sharing zero-noise switches. These switches are compared with one another, and a fundamental theorem is proved that such switches can have no more outputs than inputs. Several new classes of load-sharing zero-noise switches are developed and analyzed; in particular, switches are developed which for a given number of outputs allow more flexibility in the choice of the load-sharing factor than formerly was the case. (Author)

AD-260 139 Div. 30, 25
(26 July 61) OTS price $12.00

Armour Research Foundation, Chicago, Ill.
A STUDY OF FORCE AND DISPLACEMENT MEASURING TECHNIQUES. PART I. LINEAR AND ANGULAR DISPLACEMENT MEASURING TECHNIQUES.
Final technical rept. 15 May 59-15 Nov 60, on Propulsion System Monitoring.
Nov 60, 155p. incl. illus. tables, 187 refs.
(Contract AF 33(616)6505, Proj. 8224)
(WADD TR 61-180, pt. 1) Unclassified report

DESCRIPTORS: *Transducers, Flight, Airframes, Radiation effects, *Transformers, *Variable capacitors, Rotation, Semiconductors, Magnetic detectors, Hall effect, Magnets, *Potentiometers, Strain gages, Electron tubes, Electrolytic cells, Gas ionization, *Optical equipment, Interferometers, Digital systems, Acoustics, Microwaves, Nuclear physics, Polarization, Measurement, Magnetism, Design, Electric currents, Temperature, Linear systems, *Magnetostriction transducers, Laboratory equipment.

A study was made of electrical methods of measurement of linear and angular displacement. The study was directed toward assessing the present state of the art and providing guides toward new or improved techniques applicable to advanced military flight vehicles, particularly in regard to environmental extremes. For linear displacement measurement, it was found that existing linear variable differential transformer techniques are suitable for a substantial part of the range of temperature and nuclear radiation environments expected to be encountered. The principles of the linear variable differential transformer can be extended to still higher temperature applications by use of a conductive rather than ferromagnetic core, i.e., eddy current techniques, to avoid the Curie temperature limitation of magnetic material, at the expense of more elaborate and sensitive auxiliary circuitry. (Author)

AD-260 147 Div. 30, 25
(26 July 61) OTS price $12.50

Armour Research Foundation, Chicago, Ill.
A STUDY OF FORCE AND DISPLACEMENT MEASURING TECHNIQUES. PART II. FORCE MEASUREMENT TECHNIQUES.
Final technical rept. 15 May 59-15 Nov 60, on Propulsion System Monitoring.
Nov 60, 168p. incl. illus. tables, 81 refs.
(Contract AF 33(616)6505, Proj. 8224)
(WADD TR 61-180, pt. 2) Unclassified report

DESCRIPTORS: *Transducers, *Magnetostriction transducers, Variable capacitors, Strain gages, Resistors, Electronic circuits, *Transformers, Design, Amplitude modulation, Frequency modulation, Temperature, Radiation effects, Acoustics, Electroosmosis, Magnetism, Polarization, Hall effect, Electric fields, Light, *Photoelectric transducers, Thermoelectricity, *Piezoelectric transducers, Resistance, Elasticity.

A study was made of electrical methods of measurement of force in the range below one pound. The study was directed toward assessing the present state of the art and providing guides toward new or improved techniques applicable to advanced military flight vehicles, particularly in regard to environmental extremes. The unbounded strain gage has considerable merit for the direct measurement of force over a moderately wide range of environmental conditions. Where only dynamic forces are to be measured, piezo-

electric techniques also have a wide range of application. New piezoresistive devices for the measurement of force are promising in terms of high sensitivity and small size. Improved magnetostriction force sensors show promise for some applications. The study was also directed toward the development of new or little-used techniques for the measurement of both force and displacement. A survey was made of known physical phenomena with a view toward finding those which are not presently employed for the measurement of force or displacement but which might be adapted to this purpose. (Author)

AD-260 195 Div. 30, 5
(26 July 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
STRATEGY AND ORGANIZATION IN A SYSTEM DEVELOPMENT PROJECT,
by Thomas A. Marschak. 3 Feb 60, 59p. incl. illus. (Rept. no. P-1901-RC)
Unclassified report

DESCRIPTORS: *Research program administration, Scheduling, Production, Manufacturing methods, Scientific organizations, Mechanical engineering, *Microwave relay systems, Radio relay systems, Communication systems, Telephone communication systems, Television communication systems, *Microwave communication systems, Design.

A system is described as a complex aggregation of components, based on established principles. The study is concerned with what is efficient system development and is it observed in American industry. The intensive historical study of completed system development projects is investigated. The system considered as an example is a microwave relay system for the transmission over long distances, via a chain of relay towers, of telephone conversations and television signals. Its development was complete and its manufacture had begun in 1958. The start of its development as a system can reasonably be dated 1952. The project built up to a peak of about ninety technical persons, and its manpower and other direct costs are roughly estimated at $15,000,000. (Author)

AD-260 215 Div. 30, 9
(27 July 61) OTS price $1.60

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
COEFFICIENTS FOR AXISYMMETRIC SCHLIEREN EVALUATIONS,
by Lee Kean. May 61, 11p. incl. illus. tables. (ASD TN 61-56)
(Proj. no. 1426)
Unclassified report

DESCRIPTORS: *Gas flow, Optics, Photographic analysis, *Schlieren photography, Axially symmetric flow.

The quantitative evaluation of schlieren measurements of a broad class of axisymmetric gaseous phenomena can be performed by a procedure which is both simple to apply and insensitive to experimental error. Coefficients for the numerical integration of the evaluation equation are tabulated. The procedure is illustrated by evaluations of two theoretical functions representative of types encountered in the applications. (Author)

AD-260 218 Div. 30
(27 July 61) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
A STOCHASTIC MOTOR-LEARNING ANALOG,
by Kenneth R. Scott. Jan 61, 16p. incl. illus. (Rept. no. AFCRL-27)
Unclassified report

DESCRIPTORS: *Analog computers, Computers, Circuits, Wiring diagrams, Learning, Memory devices, Motor reactions, Cybernetics.

An electromechanical machine, capable of learning by trial-and-error to perform a simple motor act, is described. A block diagram of the electromechanical model shows the master timer, consisting of the first two banks and solenoid of a stepping switch; the short memory, consisting of a random trigger source, the third bank of the same stepping switch, 12 memory flip-flops, and 12 read-out gates; the long memory, consisting of 2 banks of a second stepping switch, and 6 memory banks each consisting of 12 flip-flops; and the evaluator, consisting of the effector arm contact, 6 evaluation contacts, 6 four-sec inhibit blocking oscillators, a flip-flop, and a reset gate. Not shown is the effector, consisting of adders for x and y outputs and an X-Y Variplotter. (Author)

AD-260 221 Div. 30, 8
(26 July 61) OTS price $4.60

Melpar, Inc., Falls Church, Va.
BROADBAND RADIATOR FOR RADIO INTERFERENCE GENERATOR SET AN/GRM-8 (XA-1),
Final rept. May 60-May 61,
by Herbert H. Hibbs and Benjamin P. Czarnaski
May 61, 46p. incl. illus.
(Contract AF 33(600)40839, Proj. 4357)
(ASD TR 61-223) Unclassified report

DESCRIPTORS: Broadband, *Test sets, *Radio interference, *Radiofrequency generators, Noise generators, Design, *Electronic equipment, Test equipment, Electromagnetic fields, Interference, Measurement, Effectiveness, Coaxial cables.

A broadband radiator was developed which provides a near-uniform radio interference field for electronic equipment susceptibility tests in the frequency range of 0.15 to 1000 mc. This radiator is intended for use in a shielded enclosure in conjunction with the AN/GRM-8 (XA-1) radio interference generator set, which generates a noise signal with a continuous pulse spectrum over the frequency range of 0.10 to 1000 mc. The broadband radiator requires no manual change to provide simultaneous operation at all frequencies between 0.15 and 1000 mc. Measurements in this frequency range were previously conducted utilizing various loop, stub, and dipole radiators requiring numerous adjustments during a single qualification test. Design considerations, technical achievements, and experimental results are presented. Eight broadband radiators were constructed. (Author)

AD-260 222 Div. 30, 9
(27 July 61) OTS price $1.00

Laboratories for Applied Sciences, U. of Chicago, Ill.
DEVELOPMENT OF TEST FACILITIES FOR STUDIES IN HYPERSONIC RANGE.

Rept. for 15 Apr 59-29 Feb 60,
by Henry Halle and Channon F. Price. Dec 60, 32p. incl. illus. tables.
(Contract AF 33(616)6363, Proj. 7360)
(WADD TR 60-414, pt. 1) Unclassified report

DESCRIPTORS: *Test facilities, Hypersonics, *Aerodynamic heating, *Re-entry vehicles, *Hypervelocity vehicles, Simulation, Model tests, Alternating current, Plasma physics, Vacuum systems, Cooling, Heat transfer, Supersonic flow, Electric arcs, *Plasma jets, Design, Tests, Calorimeters, *Re-entry aerodynamics.

Hypersonic missiles re-entering the atmosphere are subjected to severe aerodynamic heating. In order to closely simulate these severe thermal conditions for testing laboratory models, a program was undertaken which consisted of the design, construction, and testing of (1) an air-stabilized ac arc, and (2) a vacuum and cooling system to evacuate the high-temperature plasma generated by the arc. Stable and reliable operation was achieved with the ac powered arc, but it was relatively inefficient in utilizing the available power. The vacuum and cooling system to receive, cool, and exhaust to the atmosphere the plasma generated by a 1.5-megawatt air-stabilized dc arc makes testing possible with a low-density plasma and subatmospheric stagnation pressure and permits the heat flux to be adjusted independently of the enthalpy difference. (Author)

AD-260 224 Div. 30, 9
(27 July 61) OTS price $.75

Laboratories for Applied Sciences, U. of Chicago, Ill.
DEVELOPMENT OF TEST FACILITIES FOR STUDIES IN HYPERSONIC RANGE.
Rept. for 1 Mar-30 Sep 60 on The Chemistry and Physics of Materials,
by Henry Halle and Channon F. Price. Dec 60, 22p. incl. illus. tables.
(Contract AF 33(616)6363, Proj. 7360)
(WADD TR 60-414, pt. 2) Unclassified report

DESCRIPTORS: *Test facilities, Hypersonics, *Aerodynamic heating, *Re-entry vehicles, Hypervelocity vehicles, Simulation, Model tests, Alternating current, Electric arcs, *Plasma jets, Plasma physics, Vacuum systems, Cooling, Electrodes, Design, Tests, Heat transfer, Re-entry aerodynamics.

The development and results of tests of 3 different arc configurations are presented. A double-ring electrode arc unit, when discharging into the atmosphere, provided 40% utilization of the available electrical power. This ac arc head was subsequently operated in conjunction with the previously constructed vacuum system to establish subatmospheric test conditions in the plasma stream. It was found that this arc configuration-vacuum system combination resulted in reduced thermal efficiencies. (Author)

AD-260 239 Div. 30, 32
(27 July 61) OTS price $5.00

Office of Naval Research, Washington, D. C.
THE FIFTH NAVY SCIENCE SYMPOSIUM. NAVAL RESEARCH. SPONSORED BY THE OFFICE OF NAVAL RESEARCH, APRIL 18, 19, 20, 1961, U. S. NAVAL ACADEMY, ANNAPOLIS, MARYLAND.
1961, 367p. incl. illus. tables (Rept. no. ONR-9, vol. 1)
Unclassified report

DESCRIPTORS: Probability, Guided missiles, *Digital computers, Thermoelectricity, Materials, Aerodynamic heating, Spaceships, Radiation damage, Chemical analysis, De-icing materials, De-icing systems, Optical materials, Infrared spectroscopy, *Solid state physics, Dosimeters, Molecular structure, Crystals, Polymers, Free radicals, *Symposia, *Scientific research, *Naval research, Niobium, Alloys, Magnetic properties, Radiation effects, Ferrites, Particles, Infrared research, Mathematics, Mathematical analysis.

AD-260 240 Div. 30, 32
(27 July 61) OTS price $6.00

Office of Naval Research, Washington, D. C.
THE FIFTH NAVY SCIENCE SYMPOSIUM. NAVAL RESEARCH. SPONSORED BY THE OFFICE OF NAVAL RESEARCH, APRIL 18, 19, 20, 1961, U. S. NAVAL ACADEMY, ANNAPOLIS, MARYLAND.
1961, 406p. incl. illus. tables, 151 refs. (Rept. no. ONR-9, vol. 2)
Unclassified report

DESCRIPTORS: *Symposia, *Naval research, *Scientific research, Blood, Contamination, Oxygen equipment, Atmosphere models, Body temperature, Man, Thermoelectricity, Thermionic emission, Protons, Dosage, Power supplies, Hydrodynamics, High temperature research, Pions, Polymers, Molecular structure, Decomposition, Reactor coolants, Hydrides, Vinyl radicals, Aluminum, Personnel, Selection, Behavior, Training, Job analysis, Auditory acuity, Training devices, Teaching machines, Tracking, Leadership, Toxicity.

AD-260 241 Div. 30, 2, 31
(27 July 61) OTS price $6.00

Office of Naval Research, Washington, D. C.
THE FIFTH NAVY SCIENCE SYMPOSIUM. NAVAL RESEARCH. SPONSORED BY THE OFFICE OF NAVAL RESEARCH, APRIL 18, 19, 20, 1961, U. S. NAVAL ACADEMY, ANNAPOLIS, MARYLAND.
1961, 402p. incl. illus. 174 refs. (Rept. no. ONR-9, vol. 3)
Unclassified report

DESCRIPTORS: Solid state physics, Electron beams, *Symposia, Radio waves, Meteorological radio, Ducts, Oceans, Meteorological instruments, Measurements, Thin-films, Electronic equipment, Electronic circuits, Photoconductivity, Infrared detectors, Water waves, Ships, Submarines, Hydrofoils, *Oceanography, Ferroelectric materials, Ceramic materials, Barium compounds, Titanates, Naval ordnance, Antisubmarine warfare, Cathode ray tubes, Polarographic analysis, Upper atmosphere, *Naval research, *Military research, *Scientific research, Guns, Propellants, Mathematical analysis, Hydrodynamics, Beaches, Hydrology, Acoustics, Marine biological noise.

AD-260 254 Div. 30, 32
(27 July 61) OTS price $7.60

Texas U., Austin.
MACHINE LANGUAGE TRANSLATION STUDY.

Quarterly progress rept. no. 8, 1 Feb-30 Apr 61, by E. D. Pendergraft. 30 Apr 61, 73p. (Contract DA 36-039-sc-78911)

Unclassified report

DESCRIPTORS: *Machine translation, *Language, Digital computers, Programming, Magnetic tape, Coding, Transformations (Mathematics), Mathematical analysis, Design.

Two years of research by the Machine Language Translation Study at The University of Texas are summarized. The mathematical basis of a generalized computer system for language translation is explained as a series of three models. The general models can be interpreted both linguistically to obtain grammars of specific languages, and operationally to obtain translation algorithms in a wide range of complexity and competence. The current status of mathematical, programming and linguistic research is given. (Author)

AD-260 290 Div. 30, 2
(28 July 61) OTS price $1.60

Navy Electronics Lab., San Diego, Calif.
INVESTIGATION OF WINDOW FRACTURE IN BATHYSCAPH.
Research rept. for 19 Nov 60-19 Jan 61,
by J. C. Thompson, R. K. Logan and R. B. Nehrich.
20 Mar 61, 12p. incl. illus. table (NEL rept. no. 1030)

Unclassified report

DESCRIPTORS: *Oceanographic vessels, Underwater equipment, *Transparent panels, Fracture (Mechanics), Plastics, Acrylic resins, Failure (Mechanics), Plastic lenses, Maintenance, Design.

An investigation was conducted to determine causes for failure of the acrylic window in the access tube of the bathyscaph TRIESTE and recommend corrective measures. The causes were determined to be severe local stressing caused by drilling of bolt holes; mounting stresses; augmenting of these factors by aging and thermal expansion coefficient differentials; and hydrostatic compression stresses during submersion. Design suggestions are made for reducing or eliminating these conditions. (Author)

AD-260 348 Div. 30, 8
(31 July 61) OTS price $4.60

Cornell U., Ithaca, N. Y.
CONSTRUCTION OF THE DEPARTMENT OF DEFENSE IONOSPHERE RESEARCH FACILITY-II.
Summary technical rept. no. 3,
by W. Gordon, W. McGuire and others. 30 June 61, 40p. incl. illus. tables (Research rept. no. RS 22)
(Contract AF 19(604)6158)
(AFCRL-519)

Unclassified report

DESCRIPTORS: *Ionosphere, Radar equipment, Radar antennas, Radar receivers, Radar transmitters, Scientific research, Design, *Test facilities, Upper atmosphere, *Meteorological radar, Data Processing systems, Radar duplexers, Waveguides, Reflectors, Construction.

Progress is reported on the design and construction of a ionospheric radar probe. Descriptions of the following antenna equipment are included: feed support, reflector, mechanical drive system, electrical system, harmonic absorption filter, and turnstile junction. The receiver main amplifier and detectors, and data recording section are described. A transmitter block diagram with a description of operation is included. Receiver noise temperatures, both internal and external, are presented. These were predicted from tests run on the receiver parametric amplifier.

AD-260 352 Div. 30
(31 July 61) OTS price $1.10

Air Force Electronic Systems Div., Bedford, Mass.
SUGGESTED PROCEDURE FOR STUDY AND ANALYSIS OF INFORMATION REQUIREMENTS,
by Raymond Sabeh. June 61, 8p. incl. illus.
(Rept. no. ESD TN 61-58)

Unclassified report

DESCRIPTORS: *Air force operations, Command systems, Control systems, Analysis, Data, Data processing systems, Theory, *Operations research, Information theory.

The analysis stresses that critical to the design of Command-Control Systems is the determination of information requirements and knowledge concerning the manner in which the information is to be used operationally. A suggested procedure for study and analysis of information requirements is discussed. The procedures emphasize the identification of the systems missions, formulation of operational requirements, conditions under which the systems will perform and analysis of the functions involving the organization of both man and machine directed at achieving the objectives prior to considering the available hardware or men who will serve as components. (Author)

AD-260 369 Div. 30, 6
(31 July 61) OTS price $2.60

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF INSTRUCTIONS FOR TEST SET, CONTROL QRC-133A(T).
14 July 61, 25p. incl. illus. tables
(Contract AF 33(604)21206)

Unclassified report

DESCRIPTORS: *Test sets, Handbooks, Instruction manuals, Countermeasures, Operations, Maintenance, *Frequency meters, Calibration, Measurement, Frequency, *Electronic equipment, Radar transmitters, Test equipment, Control.

A description is given of the control test set, which is used to test and maintain the frequency control module of Transmitting Set, Countermeasures QRC-133A(T). It will test the reference voltage regulator, the chopper amplifier, the blower motor for proper rotation, and oven power and associatated circuitry. Operating instructions, procedures for inspection, troubleshooting, and calibration are presented as well as a list of replaceable parts.

AD-260 370 Div. 30, 6, 8
(31 July 61) OTS price $2.60

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF INSTRUCTIONS FOR TEST SET, ELECTRON TUBE QRC-133A(T).
23 June 61, 25p. incl. illus. tables.
(Contract AF 33(604)21206)

Unclassified report

DESCRIPTORS: *Test sets, Handbooks, Instruction manuals, Countermeasures, Operation, Maintenance, Electronic equipment, Electron tubes, *Tetrodes, Radar equipment, Test equipment.

A description is given of the electron tube test set for the QRC-133A(T). It tests air cooled power tetrodes for shorts between elements and for proper dynamic and static operation. Operating instructions and procedures for inspection, maintenance, troubleshooting, and calibration are presented as well as a list of replaceable parts.

AD-260 371 Div. 30, 6
(31 July 61) OTS price $2.60

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF INSTRUCTIONS FOR TEST SET, OSCILLATOR QRC-133A(T).
24 May 61, 29p. incl. illus. tables.
(Contract AF 33(604)21206)
Unclassified report

DESCRIPTORS: *Test sets, Handbooks, Instruction manuals, Radar equipment, Operation, Maintenance, *Backward-wave oscillators, Test equipment, Electronic equipment, Oscillators, Calibration.

A description is given of the oscillator test set for use with the QRC-133A(T). It is used for testing the high potential operating parameters of the backward wave oscillator and for pinpointing malfunctions to a particular high voltage supply or regulator circuit. Operating instructions, procedures for inspection, trouble shooting, and calibration are considered. A list of replaceable parts is given.

AD-260 392 Div. 30, 8
(31 July 61) OTS price $16.50

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
Interim research rept. no. 8A, 1 Sep-30 Nov 60 on High-Speed Data Processor System Research.
30 Nov 60, 257p. incl. illus. tables.
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: *Data processing systems, *Electronic circuits, *Diodes, Semiconductors, Materials, *Memory devices, Switching circuits, Computers, *Digital computers, Design, Rectifiers, Instrumentation, Mathematical logic.

Contents:
Millimicrosecond logic circuits
Clock powered circuits
Baseband circuits
Memories
Fabrication
Memory test machine design
System studies
Instrumentation

AD-260 463 Div. 30, 15, 8
(31 July 61) OTS price $9.60

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
Suppl. to Interim research rept. no. 8A, on High Speed Data Processor System Research.
1 Dec 60, 116p. incl. illus. tables (Suppl. to Interim research rept. no. 8A, AD-260 392)
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: *Computers, Design, *Memory devices, *Circuits, Mathematical logic, Diodes, Triodes, *Storage tubes, Electron tubes, *Data processing systems, Mathematical analysis, Semiconductors, Transistors, Electronic circuits, Ferrites, Solid state physics, Germanium, Rectifiers, Gallium compounds.

This supplemental report presents material not covered in the main cover of IRR-8A. The main topics are: Exploratory research, Device research and production, and Certain additions not completed in time for inclusion in the main report. These cover areas in circuit and memory development. (Author)

AD-260 471 Div. 30, 15, 8
(31 July 61) OTS price $2.60

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
System study rept. no. 4, Appendix 3 to Interim research rept. no. 8A, 1 Sep-30 Nov 60, on High-Speed Data Processor System Research,
by Peter Warburton. 30 Nov 60, 24p. incl. illus. (Appendix 3 to Interim research rept. no. 8A, AD-260 392)
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: Computers, *Circuits, Mathematical logic, *Memory devices, Design, Electronic circuits, *Data processing systems.

Contents:
The premise of Project Lightning system studies
Input-output computers
A small 48-bit computer
System design of a large 48-bit computer

AD-260 501 Div. 30, 12, 1, 16
(1 Aug 61) OTS price $13.00

Science and Tech. Section, Air Information Div., Washington, D. C.
COMPREHENSIVE ANALYSIS OF SOVIET SPACE PROGRAM (BASED ON SOVIET OPEN LITERATURE 1958-61).
22 May 61, 187p. incl. illus. tables, 216 refs.
(AID rept. no. 61-72)
Unclassified report

DESCRIPTORS: *Literature, USSR, *Space flight, Aerodynamics, Recovery, *Spaceships, Theory, Satellites, Man, *Experimental data, *Manned, Launching, Laboratory animals, Space medicine, Communication systems, Acceleration, Rockets, *Bibliography.

Contents:
Soviet Capability of Developing a Multipurpose Carrier-Rocket: Aerodynamics and space flight; Recovery problems; Possible design types of the Soviet multipurpose carrier-rocket; Possible structure of the Soviet multipurpose carrier-rocket
The Spaceship-Satellites and the Soviet Space Program: First Soviet spaceship-satellite; Man in space; Second Soviet spaceship-satellite (Sputnik V); Satellites; The Soviet space program

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-260 529 Div. 30, 8, 25
(3 Aug 61) OTS price $10.10

Electro-Mechanics Co., Austin, Tex.
RADIO FREQUENCY CALORIMETRY.
Interim rept. no. 1,
by P. G. Varlashkin, W. T. Cronenwett, and others.
1 Sep 60, 113p. incl. illus. tables, 19 refs.
(Contract AF 30(602)2360, Proj. 4540)
(RADC TN 61-160) Unclassified report

DESCRIPTORS: *Calorimeters, Radiofrequency, *Radiofrequency power, Crystal detectors, Bolometers, Thermistors, Glow discharges, Thermodynamics, Measurement, Reliability, Test equipment, Standing wave ratios.

Theoretical and experimental investigations in the field of radio-frequency power measurements are described. Particular attention is devoted to the calorimeter, since it is the only instrument currently available capable of being calibrated without recourse to auxiliary standards. Prototype models of calorimeters were constructed for both high and low power ranges. Pertinent design criteria and performance data are presented for static and flow-type calorimeters. (Author)

AD-260 611 Div. 30
(3 Aug 61) OTS price $1.10

Operations Research Center, U. of Calif., Berkeley.
FUTURE DEVELOPMENT OF OPERATIONS RESEARCH.
Summary rept. no. 1,
by George B. Dantzig. 3 Mar 61, 8p. (Rept. no. IER 172-2)
(Contract Nonr-22283)
Unclassified report

Paper was read before the Thirteenth Annual Industrial Engineering Institute (February 3-4, 1961) University of California, Berkeley.

DESCRIPTORS: *Operations research, Data processing systems, Information theory, Theory, Control, Management engineering, Research program administration, Programming.

Topics covered include a general discussion of the relation between (1) studies dealing with decision theory and shifting emphasis in engineering service, (2) the general research program of a new center of operations research in the College of Engineering at Berkeley, (3) the need for a sustained base of research in the operations research to take advantage of several successful research breakthroughs. This was followed by a discussion of two particular research developments: (4) Integrated Planning-Execution Theory, and (5) Decentralized Decision-Making, using a Decomposition Principle Approach. (Author)

AD-260 633 Div. 30, 5, 8, 14, 28
(4 Aug 61) OTS price $6.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 5. INFORMATION PROCESSING.
Quarterly progress rept., 1 Mar-31 May 61.
15 June 61, 64p. incl. illus. tables, 21 refs.
(Contract AF 19(604)7400)
(AFESD TN 61-1012) Unclassified report

DESCRIPTORS: *Digital computers, *Data processing systems, Test equipment, Memory devices, Magnetic core, *Coding, Programming, Design, *Speech transmission, Communication theory, Learning, *Communication systems, Machine translation, Speech, Magnetic tape, Perception, Memory, Electronics, Electronic equipment, Films, Magnetic materials, Theory, Intelligibility.

The FX-1 test computer was assembled. A partial checkout of the central computer was made. The machine's magnetic film memory is being checked out, prior to installation. Barring unforeseen difficulties, FX-1, with its planned 0.2-microseconds read-write memory cycle time, will soon be in operation. TX-2 continues to be a valuable laboratory-wide tool for research activities. Within the past quarter TX-2 was used on Projects MIDAS and Mercury on a pattern recognition problem and by the Research Laboratory of Electronics (M.I.T.) on an adaptive programming problem. Work on sequential coding (SECO) for two-way communications systems continues in two phases: (1) the construction with evaluation of a single decoder, and (2) the design, construction and evaluation of a two-way system. A number of improvements in both the automatic speech recognition activity and in the programs for computer interpretations of natural English text (BASEBALL) were observed. A new version of the degarbler, a computer program for automatically correcting errors in English text, was developed which promises to correct substantially more errors than earlier versions. (Author)

AD-260 643 Div. 30
(4 Aug 61) OTS price $1.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
YARNALL-WARING CO. ELECTRONIC SECONDARY REMOTE LIQUID LEVEL INDICATOR.
Evaluation rept.,
by J. Isinger. 18 July 61, 10p. incl. illus.
(NBTL Rept. no. B-366)
Unclassified report

DESCRIPTORS: Liquid level control, *Liquid level gages, Instrumentation, Vibration, Resistance, Roll, Pitch, Design, Electrical equipment, Circuits, Effectiveness.

The electronic secondary remote liquid level indicator, is designed to provide remote electrical duplication of steam drum water levels as indicated by their Yarway pressurized primary indicator (remote water level indicator), and eliminates the need for extended high pressure piping runs. The secondary indicator closely resembles the primary in shape and length of scale; its pointer is positioned by a solenoid powered by an amplifier output; that output is determined by an input voltage based upon the unbalance between two movable-core transformers, one actuated by the secondary pointer, the second by the primary pointer. The secondary unit was set up with its associated primary unit, a static head applied to the primary, and both units inclined to simulate roll and pitch conditions. The secondary indicator duplicated the primary pointer positions except under extreme 30-degree inclinations. The amplifier assembly failed electrically after approximately 1000 hours operation. Being a commercial version, not shock or vibration resistant, indication accuracy was affected by jarring or impact. (Author)

AD-260 671 Div. 30, 15
(4 Aug 61) OTS price $3.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
PROBABILITY INTEGRATORS AND RELATED INSTRUMENTS; THEIR CONSTRUCTION AND USE,
by Thomas J. White and Jean R. Williams. 28 Feb 61, 40p. incl. illus. tables, (Rept. no. AFSWC TR 61-16)
(Proj. 7812)
Unclassified report

DESCRIPTORS: *Analog computers, Probability, Integrals, *Integrators, Terminal ballistics, Interception probabilities.

This report describes several versions of an instrument generally similar to a polar planimeter which is useful for computing the probability integral relative to a drawing which shows a plane figure, an aim point, and a value for the normal dispersion. Such a drawing might represent, for example, the target and attacking weapon relationships in a weapon systems study. The instruments described herein are theoretically exact, can be made to give very accurate readings, and their use effects a considerable saving in time and effort compared with alternative methods of computing the probability integral for plane areas. Since the instruments described are not available commercially, they are described in considerable detail. The report also discusses similar or related instruments, alternative methods of computing the probability integral, and techniques for dealing with three-dimension problems. A mathematical treatment is given of the operation of instruments of this type and it is therein shown that the function f(r) which is to be integrated may take many forms. The familiar normal frequency function is merely one of the many possible forms. (Author)

AD-260 692 Div. 30, 8
(7 Aug 61) OTS price $19.75

Burroughs Corp., Paoli, Pa.
MARGINAL CHECKING TECHNIQUES STUDY.
Final rept.,
by F. M. Barsam. Feb 61, 341p. incl. illus. tables, 26 refs. (Ref. no. 681-61-336-L)
(Contract AF 30(602)2163, Proj. 5519)
(RADC TR 61-85) Unclassified report

DESCRIPTORS: Test equipment, Test methods, *Test sets, *Electronic circuits, Circuits, Maintenance, Failure (Mechanics), Automatic, Detection, Reliability, Electronic equipment, Monitors, Safety devices, Computers, Theory, Design, Electron tubes.

A survey, study, and development program on marginal checking techniques was conducted. A theory of margin checking has been developed and is presented herein. On the basis of the theory the conclusion is reached that there are two basic approaches to measuring margins-to-failure in different classes of circuits. These approaches are called indirect margin checking (IMC) and direct margin checking (DMC). The technique generally known as marginal checking is shown to be of the latter category. An advanced margin checking system was developed and proposed for use in digital equipment of the complexity of Atlas or SAGE. The concept is predominantly theoretical and not fully substantiated by hardware experience. Six IMC/DMC margin checking techniques, developed as an important part of this program, are described and evaluated. The results of the state-of-the-art survey are summarized, discussed, and analyzed. Abstracts are included of reports made available on the subject of marginal checking. (Author)

AD-260 731 Div. 30, 12, 9
(8 Aug 61) OTS price $9.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
SUMMARY OF SHOCK TUNNEL DEVELOPMENT AND APPLICATION TO HYPERSONIC RESEARCH,
by A. Hertzberg, Charles E. Wittliff, and J. Gordon Hall. July 61, 97p. illus. 130 refs.
(Rept. no. AD-1052-A-12)
(Contract AF 18(603)10)
(AFOSR TR 60-139) Unclassified report

DESCRIPTORS: Shock tubes, *Hypersonic wind tunnels, *Hypersonic flow, Re-entry aerodynamics, Re-entry vehicles, Manned, Instrumentation, *Test facilities, Simulation, Hypervelocity vehicles, Test equipment, Hypersonic nozzles, Wind tunnel nozzles.

The development of the shock tunnel is reviewed, its present capabilities are discussed, and future prospects are outlined. The ability of the shock tunnel to produce air flows at stagnation temperatures and pressures associated with hypersonic flight has been well established. The chief difficulty has been the short (millisecond) testing time. The tailored-interface technique has increased the available testing time. This extension, plus the development of rapid-response instrumentation, now permits the accurate measurement of pressures, forces, and heat-transfer rates. The hypersonic shock tunnel in its present form duplicates re-entry flight conditions for hypersonic vehicles over an important area of the re-entry flight. For some regions partial simulation must be resorted to. However, the flexibility of the shock tunnel operations permits a wide range of simulation conditions to be studied. The shock tunnel has exceeded expectations both as to its range of performance and scope of testing. Exploratory experiments have demonstrated the usefulness of the shock tunnel for the investigation of hypervelocity rarefied-gas flows associated with the re-entry of manned vehicles. (Author)

AD-260 770 Div. 30
(7 Aug 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
THE ATOMIC-HYDROGEN GUN,
by R. L. Bjork. 5 July 61, 43p. incl. illus. tables, 15 refs. (Research memo RM-1707)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Hypervelocity guns, Thermodynamics, Velocity, Hydrogen, Impact shock, Hypervelocity projectiles, Electric discharges, Helium, Design, Pressure, Equations of state, Theory, Feasibility studies.

Calculations are presented which indicate that light-gas guns powered by electrical discharges may be expected to achieve substantially higher projectile velocities than may be obtained by any present laboratory gun. The thermodynamic properties of compressed, high-temperature hydrogen are calculated and presented, and it is found that for isentropic expansions in a region representative of gun operation, the gas closely follows an equation of state, even though considerable dissociation occurs. For the same gun parameter and gas temperature, hydrogen was found to give much higher muzzle velocities than

helium. Using values commensurate with the current state of the art, it was estimated that such a gun could deliver about 10 km/sec and would have a large potential for future improvement. (Author)

AD-260 782 Div. 30
(8 Aug 61) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
THE SELECTION PROBLEM FOR MINIMAL-STATE SEQUENTIAL CIRCUITS,
by W. H. Davidson. 20 July 61, 22p. incl. illus. tables (Technical rept. no. 1901-2)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Circuits, *Special functions, *Information theory, Statistical analysis, Mathematical logic, Equations, Theory, Matrix algebra, *Data processing systems, *Data storage systems, *Switching circuits, Digital systems, *Sequence switches.

A technique is discussed that will select from the set of minimal-state circuits those which will have the lowest expected logic cost. The relation between information content and the expected cost of the logic is clearly demonstrated for the cases discussed. This indicates that if circuits can be designed that have small information contents, they will also have inexpensive associated logic. It may be possible to find design procedures that will generate circuits with small information contents and thus with low-cost logic. Also, it seems reasonable to expect that a relation should exist between an appropriately defined information content for the circuit's input-output sequences and its information content. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-260 235 Div. 31, 4
(27 July 61) OTS price $2.75

Naval Research Lab., Washington, D.C.
THE PRESENT STATUS OF CHEMICAL RESEARCH IN ATMOSPHERE PURIFICATION AND CONTROL ON NUCLEAR-POWERED SUBMARINES.
Annual progress rept.,
ed. by V. R. Piatt and E. A. Ramskill. 14 July 61, 134p. incl. illus. tables, 128 refs. (NRL rept. no. 5630)
Unclassified report

DESCRIPTORS: *Submarines, Nuclear propulsion, *Carbon dioxide, *Oxygen, Contamination, Atmosphere, Purification, Controlled atmospheres, Sampling, Chemical analysis, Carbon compounds, Monoxides, Aerosols, Hydrocarbons, Photosynthesis, Algae, Sea water, Ventilation, Chromatographic analysis, Gases, Arsines, Ozone, Antimony compounds, Hydrides, Ammonia, Ethylenedinitrilo tetracetates, Hydrogen, Gas leaks, Detection.

OXYGEN SOURCES: The sulfate-cycle system; Algae in a photosynthetic gas exchanger; Chlorate candles; Weight economics of CO2 and O equipment for closed spaces; The analysis of sea water for atmospheric gas content. CO2 REMOVAL: The use of versene to improve MEA performance; Alkazid M. ATMOSPHERE SAMPLING AND ANALYSIS: Gas chromatography in the study of trace organic vapor contaminants; The Mk III and Mk IV atmosphere analyzers; Concentrations of hydrocarbon vapors in submarine atmospheres by carbon sampling; Arsine and stibine analysis; Analysis for ozone; Liquid-O contaminants; Determination of monoethanolamine and ammonia in submarine atmospheres; Description of NRL Model E-5753 leak detector. ELIMINATION OF CONTAMINANTS: The CO/H2 burner; Water-thinned paints for submarine interiors; Aerosols in nuclear submarines; Catalytic combustion of aerosols; Thermal degradation of triaryl phosphates.

AD-260 250 Div. 31
(27 July 61) OTS price $2.60

Visibility Lab., U. of Calif., San Diego.
CONCEALMENT DESIGN BY ENGINEERING METHODS,
by J. I. Gordon. June 61, 23p. incl. illus. (SIO ref. no. 61-16)
(Contract NObs-72092, Proj. S F001 05 01)
Unclassified report

DESCRIPTORS: *Camouflage, Camouflage paints, Naval vessels, Effectiveness, Visibility, Detection, Target recognition, Measurement, Photometers, Range finding.

An engineering method has been developed for minimizing the contrast of a Navy vessel under specified conditions. The purpose of this report is to describe the method and to illustrate the effectiveness of its use. The visual target selected to demonstrate the method was a destroyer. To facilitate the calculations, the form of the destroyer was simplified. A three dimensional model was employed approximating but reducing in complexity the general structure of the ship by retaining the actual side, top and front projected areas. Although the sighting ranges of an aerial observer were minimized by the concealment paints, the sighting ranges of an observer at sea level are greater than for the same ship painted with standard Navy paint. The appearance of the two ships when viewed against the horizon sky from the front and from the rear. In the first case the lighter paint on the standard vessel has made it lighter than the background whereas the concealment paint makes it appear as a dark target. From the rear both are seen in the shadow and are dark targets, with the standard vessel slightly less visible. (Author)

AD-260 436 Div. 31, 30
(1 Aug 61) OTS price $6.60

Wave Research Lab., U. of Calif., Berkeley.
SHIP RESISTANCE AND MOTIONS IN UNIFORM WAVES AS A FUNCTION OF BLOCK COEFFICIENT,
by O. J. Sibul. June 61, 69p. incl. illus. table (Series 61, Issue no. 19)
(Contract Nonr-22218)
Unclassified report

DESCRIPTORS: *Ships, *Motion, Ocean waves, Water tunnels, Model tests, Hydrodynamics, *Marine engineering, Drag.

A series of experiments were performed to study the effect of block coefficient and the wave

steepness on the added resistance of ships in uniform waves. Five-foot models of Series 60 with block coefficients 0.60, 0.70, 0.80, and a destroyer model with a block coefficient of 0.492 were chosen. The models were towed in waves five feet long at wave steepnesses varying between 1:68 and 1:14. Still water resistances were measured in separate experiments and the added resistance due to the oncoming waves derived by subtracting the still water resistance from the total resistance in waves. Heaving and pitching motions were measured and the bow submergence and emergence estimated for each case. The results indicated that the added resistance depends upon the block coefficient, the speed of the ship, and the steepness of the waves. It has a maximum in the vicinity of the maximum motions and decreases again for the higher speeds. The added resistance reaches higher values per unit displacement for smaller block coefficients. (Author)

AD-260 461 Div. 31
(1 Aug 61) OTS price $6.60

Norwegian Ship-Model Experiment Tank, Trondheim.
300 TONS, 50 KNOTS HYDROFOILCRAFT.
Rept. no. 1,
by J. K. Lunde and H. AA. Walderhaug. 1961,
1v. incl. illus. tables.
(Contract N62558-2596)
Unclassified report

DESCRIPTORS: *Hydrofoil boats, *Hydrofoils, Ship hulls, Marine propellers, Model tests, Design, Dynamometers, Motion, Maneuverability, Drag, Lift, Roll, Yaw, Hydrodynamics.

Still water tests were conducted with the model of a 300-ton 50-kn hydrofoilcraft. Design details of hull, foils, and dynamometre are presented in a series of illustrations and the test results are given in tables and diagrams showing resistance, heave, and trim in displaced-, take-off, and foilborne condition; and transverse and longitudinal, static stability, and behaviour of craft during turning at 50 knots. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-260 607 Div. 32, 15
(3 Aug 61) OTS price $1.60

Operations Research Center, U. of Calif., Berkeley.
QUADRATIC PROGRAMMING. A VARIANT OF THE WOLFE-MARKOWITZ ALGORITHMS,
by George B. Dantzig. 14 Apr 61, 12p. incl. illus. 10 refs. (Research rept. no. 2; Rept. no. IER 172-3)
(Contract Nonr-22283)
Unclassified report

DESCRIPTORS: *Linear programming, Economics, *Scheduling, Combinatorial analysis, Mathematical analysis.

AD-260 666 Div. 32, 30
(8 Aug 61) OTS price $2.60

Indiana U., Bloomington.
AUTOMATIC LANGUAGE ANALYSIS.
Quarterly rept. no. 5, 1 Mar-31 May 61,
by F. W. Householder, Jr. and J. Lyons.
30 June 61, 29p. incl. illus.
(Contract AF 30(602)2185)
Unclassified report

DESCRIPTORS: *Language, *Vocabulary, *Digital computers, Coding, Programming, Dictionaries, Punched card method, Automatic, *Data processing systems.

AD-260 733 Div. 32
(8 Aug 61) OTS price $2.60

Cowles Foundation for Research in Economics, Yale U., New Haven, Conn.
SOME EMPIRICAL ESTIMATES OF SHORT RUN PRICE AND OUTPUT POLICIES,
by Edwin S. Mills. 27 July 61, 23p. incl. illus. tables. (Cowles foundation discussion paper no. 123)
(Contract Nonr-305507, Proj. NR 047-006)
Unclassified report

DESCRIPTORS: *Economics, *Mathematical prediction, *Supplies, Costs, Series, Production.

Some attempts were made to estimate short run reactions of firms to changes in their inventory, sales anticipations, etc. Four industry studies are summarized which are part of a larger project on optimum price and output policies on which the author is engaged. The technique used in the study is the very simple one of finding linear approximations to two complicated price and output decision rules and then estimating the linear approximations from relevant monthly (or, in one case, quarterly) data. (Author)

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk will be included in the cumulative indexes.

BIBLIOGRAPHY

OTS SB-468 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
SOAPS, DETERGENTS, CLEANING AGENTS (SUPPLEMENT TO CTR-333). July 61, 7p. 88 refs. OTS Selective Bibliography SB-468.

DESCRIPTORS: *Detergents, *Soaps, *Cleaning fluids, Bibliography, Radiological contamination, Radioactive isotopes.

Lists 88 PB reports, translations, and AEC reports added to the OTS collection during the period 1958 to June 1961. Issued as a supplement to CTR-333 which was published in 1957 and which lists 323 titles added to the OTS collection during the period 1930 to 1957. Of special interest are 3 reports listed on industrial potential of radioisotopic methods in the synthetic detergent and soap industry, and 2 reports on effectiveness of detergents in removing radioactive decontamination. (Author)

OTS SB-436 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
VIBRATION. June 61, 21p. 436 refs. OTS Selective Bibliography SB-436.

DESCRIPTORS: *Vibration, Test equipment, Vibration isolators, Bibliography, Electrical equipment, Electronic equipment, Shock, Damping, Metallurgy.

Lists 365 PB reports, translations, and AEC reports added to the OTS collection during the period 1950 to July 1961. Reports are arranged in the following categories: Vibration Theory, Analysis and Measurements; Vibration Testing Equipment; Vibration and Shock, Electrical and Electronic Equipment; Vibration Damping and Isolators; Vibration, Mechanical; Vibration in Metallurgy: Vibration, General; Vibration, Physiological Effects; AEC reports on Vibration; Government-Owned Patents. (Author)

ASTRONOMY

PB 150 640 $1.10

Michigan U., Ann Arbor.
FINAL REPORT, by Martha H. Liller. Rept. on Contract Nonr-2815(00). 9 Sep 60, 3p. 2 refs.

DESCRIPTORS: *Galaxies, Brightness, Determination.

An investigation was made of the distribution of brightness in a group of 31 elliptical and early-type spiral galaxies in the Virgo Cluster.

BEHAVIORAL SCIENCES

PB 157 267 $3.60

Interaction Lab., Yale U., New Haven, Conn.
PROBLEM SOLVING AND SOCIAL INTERACTION, by Omar Khayyam Moore and Morris I. Berkowitz. Technical rept. no. 1 on Contract SAR/Nonr-609(16). 15 Nov 56, 38p. 26 refs. AD-118 379.

This report released for sale to the public 16 Aug 61.

DESCRIPTORS: *Group dynamics, *Games theory, *Sociology, Reasoning.

The over-all objective of the program is to make a contribution to the construction and testing of a rigorous theory of both individual and group problem solving. To this end, a special effort is being made to face and resolve fundamental conceptual difficulties, and to devise appropriate experimental techniques for testing propositions formulated in the light of whatever conceptual clarification is achieved. This report (1) discusses briefly two formal investigations undertaken this past year and (2) presents an empirical study concerned with the relationships between von Neumann and Morgenstern's theory of games of strategy and certain sociological analyses of interactional forms and processes. (Author)

Human Engineering

PB 157 265 $2.60

[Aerospace Medical Div.] Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
THE INFLUENCE OF TRAINING ON THE TACTUAL DISCRIMINABILITY OF KNOB SHAPES, by Gordon A. Eckstrand and Ross L. Morgan. Rept. on Functional Coding of Controls for Ground and Airborne Electronic Systems. Jan 56, 22p. 17 refs. WADC Technical rept. 56-8; AD-94 606.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Electronic systems, *Control knobs, Human engineering, Coding, Training, Effectiveness.

To obtain data concerning the degree to which the tactual discriminability of a group of knob shapes could be improved by training, three matched groups of 20 subjects each were tested on a task which required that they discriminate tactually among four similar knob shapes. During the test, a knob shape was presented visually for about two seconds. Following this, the subject grasped an unseen knob attached to the top of a lever. The subject operated the lever if he believed the knob sampled tactually was the same as the one viewed, but he removed his hand if he believed it to be different. Each subject made two series of 24 such discriminations. Errors and the time required for each discrimination were recorded. Prior to performing this task a

Control (C) Group was given no training, A Tactual-Name (T-N) Group learned to associate "names" with the feel of the knobs, and a Tactual (T) Group was given experience at feeling the knobs only. Group T-N was superior to Group C by both the time and errors criteria. Group T was superior to Group C in terms of the errors criterion only. All groups improved their performance from the first half to the second half of the discrimination trials.

PB 157 255 $2.60

Iowa State U. [Iowa City].
CHARACTTERISTICS OF DISCRETE MOVEMENTS IN THE HORIZONTAL PLANE WHEN EXECUTED WITH ONE AND WITH TWO HANDS, by Judson S. Brown, Arthur T. Slater-Hammel, and E. A. Bilodeau. Rept. no. 5 on Contract N5ori-57, proj. 2, Aug 48, 21p. 4 refs. ATI-35 622.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Hands, Motion, *Human engineering, Aviation medicine.

BIOLOGICAL SCIENCES

PB 155 189 $3.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
MODIFICATION OF HUMAN CENTRIFUGE AT THE AVIATION MEDICAL ACCELERATION LABORATORY; PROGRESS REPORT CONCERNING. 1 Mar 61, 36p. NADC-MA-L6101; AD-251 947.

DESCRIPTORS: Biophysics, Astronautics, Acceleration, Rotation, Space medicine, Gondolas, Flight simulators, *Centrifuges, Design, Simulation, High altitude, Gimbals, Slip rings, Control systems, Stresses, Yaw,

This report includes:
McKiernan-Terry Corp., Dover, N. J.
JOHNSVILLE N. A.D. C. HUMAN CENTRIFUGE MODIFICATION PROGRAM (JOB NUMBER 19042). Technical progress rept. nos. 1-6, 31 Aug 60-21 Feb 61. 21 Feb 61, 1v. (Contract N62269-825)

PB 150 986 $1.10

Lamont Geological Observatory, Palisades, N. Y.
THE EFFECT OF TEMPERATURE ON THE POPULATION GROWTH OF MARINE ORGANISMS, by Carolyn Beckman. Final rept. on Contract Nonr-266(41). 22 Sep 60, 10p. 8 refs. AD-244 747

DESCRIPTORS: *Marine borers, *Marine biology, Aquatic animals, Growth, Population, Temperature, Ecology, Genetics.

The morphology of the pleotelson was investigated in a number of populations of Limnoria tripunctata to find out if geographically separated populations showed different percentages of variation in some characteristics of the pleotelson. It was thought that variations in morphology of the pleotelson might serve as a clue to finding populations that were genetically isolated. Populations of the two species, L. lignorum and L. tripunctata were grown at different temperatures. A series of experiments was conducted with different salinities and temperatures in order to determine the combined effect on survival. It appears probable that in some cases the geographic range of Limnoria tripunctata may be limited by a combination of temperature and salinity, rather than by one or the other. (Author)

PB 152 248 $1.60

Texas Agricultural Experiment Station, College Station.
AMINO ACID METABOLISM IN BACTERIA, by John Mack Prescott. Final rept. on Contract Nonr-2204(00). 4 Oct 60, 12p. 16 refs. AD-245 352.

DESCRIPTORS: *Amino acids, *Metabolism, *Bacteria, *Streptococcus, Growth, Culture media, Carbon dioxide, Nitrogen, Nutrition, Sources, Inhibition, Biosynthesis, Ammonium radicals.

The present investigation was undertaken with the objectives of studying (1) inhibition of bacterial growth by amino acids and the reversal of such inhibition, (2) the biological synthesis and interconversions of some amino acids, and (3) some of the factors which influence the requirements of Streptococcus bovis for nitrogenous compounds. The most significant result noted was the ability of these strains to utilize simple ammonium compounds as a primary nitrogen source and their inability to utilize most individual amino acids as sole nitrogen sources for rapid, heavy growth. Such simple nutritional requirements for nitrogen have not been reported for any other number of genus Streptococcus. Carbon dioxide affects the ability of S. bovis to grow in media containing ammonium salts, just as it does in media containing arginine as the nitrogen source. In both of these media, removal of CO_2 always results in growth failures. A series of nutritional experiments was run in order to investigate the relationship of CO_2 to nitrogen requirements. (Author)

Anatomy and Physiology

PB 155 302 $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
CESSATION OF SHIVERING FOLLOWING FOREBRAIN LESIONS IN ANESTHETIZED CATS, by F. Jacobson, P. Craig and R. Squires. Rept. no. 23 on Task MR005.15-2002.1. 31 Dec 60, 22p. 13 refs. NADC-MA-6042; AD-252 885.

DESCRIPTORS: *Brain, Surgery, *Shivering, Inhibition, *Body temperature, Control, Temperature perception, *Hypothermia, *Hypothalamus.

Shivering ceased after electrolytic lesions were made in the forebrain of 14 cats lightly anesthetized with pentobarbital sodium. Ten of these were further tested for tremor during warming and recooling after the cautery. Shivering resumed in one animal and was stopped by enlargement of the lesion. Cooling rates could be compared in five cats, which cooled faster after operation. Some lesions extended from the corpus

callosum to the optic chiasma. Others barely encroached upon the septum pellucidum and continued only into the upper third of the preoptic region. A volume common to all lesions entended approximately 1/2 mm from the midline on the right and divided the anterior commissure and upper third of the preoptic region. Large unilateral lesions 2 mm rostral or 4 mm lateral to this overlap volume were ineffective, as were smaller lesions 4 mm dorsal to it. Shivering was recorded by large strip electrodes, or by a balloon and transducer, attached to a hind leg of 12 cats. (Author)

PB 150 622 $2.60

Columbia U., New York.
POPULATION DYNAMICS OF A VARIANT t-ALLELE IN A CONFINED POPULATION OF WILD HOUSE MICE, by L. C. Dunn and Howard Levene. Rept. on Contracts AT(30-1)-1804 and Nonr-266(33). [1960] 24p. 11 refs. CU-45-60-Nonr-266(33)-MS; AD-242 541.

DESCRIPTORS: Mice, Rearing, *Population, *Chromosomes, Mathematical analysis, Fertility, Theory, *Probability, Sampling, *Genetics.

Two small samples in 1952 from a confined population of wild house mice showed the presence of two t-alleles, a recessive lethal, t^{w1} and a viable with male sterility in homozygotes, t^{w2}. Two larger samples were taken, one in 1955 including 43 fertile males and 57 fertile females, and one in 1959 including 42 fertile males and 88 fertile females. Analysis of 32 t-alleles recovered from these samples gave only t^{w2}, suggesting that t^{w1} is no longer present in this population. While male t/t^{w2} descendants of t^{w2} mice from the 1952 samples transmitted t^{w2} to about 95% of their offspring, +/t males from the 1955 and 1959 samples had a transmission ratio of about 85%. This difference is statistically highly significant, but the reason for it is unknown. The 1955 and 1959 samples give an overall estimate of 0.87 for the gene frequency of the t-allele in adults, without significant heterogeneity. The opposing forces of sterility of t/t males and a transmission ratio of 0.85 would lead to an equilibrium gene frequency of 0.70, suggesting the presence of other selective forces acting against t in the confined population. Theoretical consideration of the behavior of genes like t^{w2} in a small population shows that there is a distinct possibility that at some generation all males will be t/t and the population will then become extinct. Thus, other things being equal such viable alleles are less disadvantageous than recessive lethal alleles in intrapopulation selection, but more disadvantageous in interpopulation selection. (Author)

Pathology

PB 155 301 $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF COBALT POLYCYTHEMIA ON THE ACCELERATION TOLERANCE OF THE RAT, by E. R. Stiehm and Jerry M. Lyle. Rept no. 2 on Proj. MR 005.15-0002.15. 1 Mar 61, 10p. 13 refs. NADC-MA-6102; AD-252 886.

DESCRIPTORS: *Polycythemia, *Cobalt, Anoxia, *Acceleration tolerance, Growth, Inhibition, Erythrocytes, *Oxygen consumption, Therapy, Tissues (Biology), Countermeasures.

Twenty-five animals were made polycythemic by cobalt administration. The action of cobalt resulted in some growth retardation and an average increase in hemoglobin from 16.9 g/100 ml to 21.9 g/100 ml. The tolerance to positive acceleration was then measured using a physiologic end point approaching death. Nine animals were centrifuged immediately after cobalt administration and 16 were centrifuged 10 days after cessation of cobalt, at which time any toxicity due to cobalt has disappeared but polycythemia persists. No significant difference of tolerance to acceleration was noted in either cobalt group as compared to control rats, suggesting that increasing the amount of oxygen to the tissues does not result in a reversal of the cellular anoxia caused by positive acceleration. (Author)

PB 154 342 $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
NEGATIVE COMPLEMENT FIXATION REACTION FOR PRESUMPTIVE AUTO-ANTIBODIES IN SERA OF BURNED RABBITS, by E. Richard Steihm, B. David Polis, and Fred A. Stutman. Rept. no. 7 on Task MR005.13-8003.1. 8 Dec 60, 7p. 6 refs. N ADC-MA-6038; AD-250 127.

DESCRIPTORS: *Burns, *Serum proteins, Thermal radiation, *Antigens, *Antibodies, Tissues (Biology), *Complement, Test methods, *Immunology.

The sera of thermally burned rabbits, containing increased amounts of antibody rich gamma-globulin was studied by complement fixation techniques in a manner designed to reveal the presence of auto-antibodies directed against presumptive toxic factors released into the sera as a result of the burn. The sera of two convalescent rabbits who had been burned over a four-week period was titrated against the sera of four acutely burned rabbits. No immunologic interaction was demonstrated. This suggests that auto-antibodies are not formed or that the toxic factors or the antibody or both are not present in the blood stream. (Author)

PB 150 623 $6.60

Columbia U., New York.
ABO INCOMPATABILITY, by Howard Levene and Richard E. Rosenfield. Rept. on Contract Nonr-266(33) and Public Health Service Grant H-4456. 1 Sep 60, 65p. 89 refs. CU-46-60-Nonr-266(33)MS; AD-242 800.

DESCRIPTORS: *Blood, Pathology, *Hematology, *Erythrocytes, Genetics, *Pregnancy, Fertility, Theory, Mathematical analysis, Classification, *Infants.

ABO erythroblastosis is highly restricted in its distribution to the incompatible offspring of type O mothers. The etiology seems to be diffusable isoagglutinins in the serum of many type O individuals. Although serious as a health problem, ABO erythroblastosis does not represent a serious fetal loss from a biological point of view. On the other hand, evidence of many kinds shows a much larger and biologically important loss of possible incompatible children. The loss is estimated to be of the order of 8 to 35 percent, with 25% a likely value. The loss of prospective incompatible children has been shown, with varying degrees of assurance, to be due to infertility or relative infertility of some incompatible

matings, to abortions, to perinatal deaths, and possibly to very early loss of incompatible offspring due to failure of ABO incompatible sperm to fertilize eggs, or miscarriage so early as not to be recognized as such. Finally there is strong evidence that fetuses that are incompatible with the mother with respect to ABO are rarely able to immunize her to the Rh factor. Although this tends to give incompatible infants an advantage, Rh hemolytic disease is so infrequent (ca 0.5%) that this effect is negligible in comparison with the estimated deleterious effects of ABO incompatibility (ca 5%). (Author)

PB 152 120 $2.60

New York Medical Coll., N. Y.
PROGRESS REPORT. Rept. for 1 Feb-15 Sep 60 on Contracts Nonr-2754(00) and (01). 1960, 30p. AD-245 982.

DESCRIPTORS: *Alloxan, *Diabetes, *Blood, Cells (Biology), Hemoglobin, Plasma proteins, Tissues (Biology), *Transplantation, Growth, Secretion, Pancreas, Age.

It has been established that β cell differentiation does not occur in the fetal period but begins 4 to 6 hours after birth. The ideal donor age is about the 15th fetal day. The age of the host, at least up to 6 months is not of particular consequence to the life of the ideal donor tissue. The ocular sinus technique for obtaining large blood samples at frequent intervals and as an injection route for introducing substances directly into the blood stream of hamsters has been modified and expanded.

The normal blood picture has been established for hamsters of several age groups: 4 to 5 weeks; 8 to 9 weeks; 6 months; one year. It has been observed that a high percentage of diabetic animals, especially the low diabetics, recovered during the first month after transplant. The evidence seems rather clear that the transplants, at least when placed in a diverticulum of the pouch mucous membrane actually secrete. It has been shown conclusively that treatment of the host with Cortisone increases the growth rate of the implant. In animals treated with both Cortisone and Insulin, the growth rate of the implant was more rapid than that found in untreated animals but was not as great as that seen in animals treated with Cortisone alone as long as the Insulin was being given. (Author)

AD-258 191 $5.00

Science and Technology Div., Library of Congress, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY (FORMERLY: AVIATION MEDICINE). AN ANNOTATED BIBLIOGRAPHY. VOLUME IV: 1955 LITERATURE, by Arnold J. Jacobius, Roman Kenk and others. 1961, 344p. 1515 refs.

DESCRIPTORS: *Space medicine, *Aviation medicine, Bibliography.

References are arranged alphabetically by author; abstracts are informative; and full bibliographic information is provided, including foreign and translated titles, volume and issue numbers, place of publication (if foreign), inclusive paging, full dates, and library call numbers or other location symbols. (See also PB 171 029)

Radiobiology

PB 171 949 $6.00

Convair, San Diego, Calif.
MEDICAL AND INDUSTRIAL HYGIENE PROCEDURES FOR NUCLEAR OPERATIONS, by R. C. Armstrong. Rept. on Health Hazards of Materials and Radiation, Contract AF 33(616)5967. Nov 60, 465p. 334 refs. WADD Technical rept. 60-813; AD-247 724.

DESCRIPTORS: *Landing fields, Airports, Aircraft nuclear propulsion, Nuclear propulsion, *Radiation hazards, Radioactivity, *Radiobiology, Handbooks, Instruction manuals, *Military facilities, Construction, Radiological physics, Radiation injuries, Countermeasures, Training, Instrumentation, Data processing systems, Dosimeters, Hazards, Medical personnel, Bibliography.

This manual consists of discussions and descriptions of general and specific procedures useful as guides in the construction of an installation and in preparation of local medical and industrial hygiene procedures for nuclear aircraft operational activities. Part I of this manual includes medical organization, basic medical science problems, medical management of radiation injuries, special medical facilities, emergency procedures and data handling procedures appropriate for a nuclear aircraft base and other radiation facilities. Part II includes similar coverage of industrial hygiene problems encountered on a radiation facility of this type. Examples of special medical and industrial hygiene forms are given and bibliographies are included on all major topics. (Author)

HW-69500 $3.00

Hanford Atomic Products Operation, Richland, Wash.
HANFORD BIOLOGY RESEARCH ANNUAL REPORT FOR 1960, ed. by F. P. Hungate and E. G. Swezea. Report on Contract AT(45-1)-1350. 10 Jan 61, 206p.

CHEMISTRY

ANL-6364 $0.50

Argonne National Lab., Ill.
PURIFICATION OF FLUORINE BY DISTILLATION, by E. Rudzitis and J. L. Settle. Rept. on Contract W-31-109-eng-38. June 61, 16p.

PB 152 086 $2.60

Inorganic Labs., Western Reserve U., Cleveland, Ohio.
INORGANIC MACROMOLECULES CONTAINING A Si-O-M LINKAGE, by Mark M. Chamberlain. Technical rept. no. 1 on Contract Nonr-1439(07). 23 Sep 60, 26p. AD-243 531.

DESCRIPTORS: *Inorganic substances, *Polymers, Molecules, *Chemical bonds, Silicon, Oxygen, Metals, Esters, Instrumentation, Synthesis, Chemical reactions, Metalorganic compounds, Vanadium compounds, Molybdenum compounds, Phosphorus compounds.

The purposes of this investigation were: (1) to prepare polymeric materials containing a silicon-oxygen-metal (metalloid linkage; (2) to prepare the monomeric silyl metal esters in order to develop techniques for the formation of the Si-O-M bond and analytical procedures for metal and silicon determination; (3) to develop instrumentation for the differential thermal analysis of silyl polymers and esters; and (4) to investigate reactions which might lead to strictly inorganic polymers of the form $(M(Cl)\text{-}O\text{-}M\text{-}O)_n$ in which the M-Cl bond could be solvolyzed with organic amines or alcohols to yield pliable, heat stable mixed organic-inorganic materials. Three reactions were found to be readily applicable for the preparation of the silyl metal esters: (1) $n\phi_3SiONa + MCl_n \rightarrow (\phi_3SiO)_nM + {}_nNaCl$; (2) $n\phi_3SiOH + MCl_n + {}_n base \rightarrow (\phi_3SiO)_nM + {}_n base \cdot HCl$; and (3) $n\phi_3SiOH + M(OR)_n \rightarrow (\phi_3SiO)_nM + {}_n ROH$. Polymer formation was attempted through the reactions: (1) $n\phi_2Si(ONa)_2 + MCl_n \rightarrow$ polymer (Si-O-M-O-Si etc.) + NaCl; and (2) $M_oO(OH)_2Cl_2 + MX_n$ or $M(OR)_n \rightarrow$ polymer + HX or ROH. (Author)

NAS-NS-3103 $0.50

Jeppson Lab., Clark U., Worcester, Mass.
LOW-LEVEL RADIOCHEMICAL SEPARATIONS, by T. T. Sugihara. Apr 61, 38p.

UCRL-9695 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
CRYSTAL STRUCTURE AND PHYSICAL PROPERTIES OF AMERICIUM METAL, by Denis Bayman McWhan. Rept. on Contract W-7405-eng-48. May 61, 104p.

UCRL-9709 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE PREPARATION OF SOME GERMANIUM HYDRIDES, by John E. Drake. Rept. on Contract W-7405-eng-48. 18 May 61, 21p.

UCRL-6444 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE PREPARATION AND IDENTIFICATION OF N-FLUORO-N'-TRIFLUOROMETHYLDIAZINE-N'-OXIDE, by Jack W. Frazer, Bert E. Holder, and Earl F. Worden. Rept. on Contract W-7405-eng-48. 8 May 61, 19p.

PB 154 209 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
A PIPETTING DEVICE FOR VOLUMES OF 10^{-4} TO 10^{-9} MILLILITERS, by N. Farlow, S. Wiel and J. Polissar. 18 Nov 59, 19p. 8 refs. Research and development technical rept. USNRDL-TR-389; AD-232 806.

DESCRIPTORS: *Pipettes, Laboratory equipment, Capillary tubes, *Microchemistry, Microanalysis, Films, Calibration, Particles, Airborne, Sampling.

A pipetting device for the measurement and transfer of small liquid samples in the volume region 10^{-4} to 10^{-9} milliliters is described. The instrument employs a micromanipulator to hold and maneuver a fine glass capillary pipette under a wide field stereoscopic microscope. The capillary is a replaceable unit having a male ball joint at one end which is clamped in a socket joint at the manipulator arm. Air pressure or vacuum communicated to the pipette through the bore of the ball and socket joint by a piping and valve system permits precise control of pressure on the liquid column in the capillary. By balancing capillary attraction with air pressure, a liquid column can easily be brought to rest at any point in the pipette. Scale marks placed on the exterior of the pipette can be accurately related to the liquid volume by a simple calibrating procedure, reliable to about 2% in the 10^{-4} ml region and to about 8% in the 10^{-9} ml zone. (Author)

TID-7610 $1.75

Oak Ridge National Lab., Tenn.
NUCLEAR REACTOR CHEMISTRY. Proceedings of the First Conference, Gatlinburg, Tenn, 12-14 Oct 60.

NAS-NS 3102 $0.75

Oak Ridge National Lab., Tenn.
SEPARATIONS BY SOLVENT EXTRACTION WITH TRI-N-OCTYLPHOSPHINE OXIDE, by J. C. White and W. J. Ross. 8 Feb 61, 60p.

PWAC-340 $1.50

Pratt and Whitney Aircraft Div., United Aircraft Corp., Middletown, Conn.
METHODS FOR THE ANALYSIS OF COLUMBIUM AND ITS ALLOYS. Rept. on Contract AT(11-1)-279. 30 June 61, 56p.

Organic Chemistry

PB 154 692 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
ANALYSIS OF CREOSOTE BY COLUMN CHROMATOGRAPHY, by Richard W. Drisko and Harry Hochman. Interim rept. 1 Oct 59, 13p. 19 refs. Technical note N-361; AD-250 626.

DESCRIPTORS: *Creosote, *Chromatographic analysis, Separation, Petroleum, Toxicity, Hydrocarbons, Chemical analysis, Coatings.

The object was to describe the chromatographic separation of the saturated hydrocarbon fractions from a number of creosotes, petroleum oils, and creosote-petroleum blends and to describe the toxicities of these chromatography fractions. RESULTS: An effective method of separating saturated hydrocarbons from creosote and petroleum oils was developed. The coke oven creosotes investigated had extremely low saturated hydrocarbon contents, while creosotes produced at lower carbonization temperatures contained significantly greater amounts. The saturated hydrocarbon fractions from both creosotes and petroleum oils were all relatively nontoxic to Limnoria and teredo. (Author)

PB 154 690 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SEPARATION OF SATURATED HYDROCARBONS FROM CREOSOTE AND THEIR TOXICITY TO MARINE BORING ORGANISMS, by Richard W. Drisko and Harry Hochman. Interim rept. 31 Aug 59, 11p. 16 refs. Technical note N-359; AD-250 624.

DESCRIPTORS: *Marine borers, *Hydrocarbons, *Creosote, Separation, Wood, Preservation, Countermeasures, Inhibition, Naval shore establishments, Toxicity, Chromatographic analysis, Ultraviolet spectroscopy, Tests, Test methods.

Although a number of methods are reported in the literature for the spearation of saturated hydrocarbons from creosote, none was found to give a complete separation. A chromatographic adsorption procedure has been developed which can separate the saturated hydrocarbons from the other constituents of creosote. Davison Grade 922 silica gel is used as the adsorbent, and n-hexane is used as the eluent. Saturated hydrocarbons added to wholly aromatic creosote were recovered quantitatively by this procedure. Ultraviolet spectral analyses of the saturated hydrocarbon fractions separated from both creosote and creosote-petrolatum blends proved the absence of aromatic contamination. Saturated hydrocarbons separated from creosotes produced at lower carbonization temperatures were relatively nontoxic to adult Limnoria and to Teredo larvae. (Author)

PB 154 498 $6.60

Pennsylvania U., Philadelphia.
EXPERIMENTAL AND THEORETICAL RESEARCH TO SYNTHESIZE FREE RADICALS OF THE AMINIUM SALT AND HYDRAZYL SERIES, by Robert I. Walter. Final rept. 15 Sep 57-15 Sep 60 on A Study of the Preparation and Physical Properties of Stable Organic Free Radicals, Contract DA 36-039-sc-74917. [1960] 64p. 44 refs. AD-248 371.

DESCRIPTORS: Ultraviolet spectroscopy, Resonance, Spin, Synthesis, Phenyl radicals, Nitro radicals, Electrons, Nitroso radicals, *Free radicals, *Hydrazines, *Amines, Benzenes.

The preparation of 1, 1-diaryl-2-picrylhydrazines through the reaction sequence: secondary amine, secondary N-nitrosoamine, 1, 1-diarylhydrazine, 1, 1-diaryl-2-picrylhydrazine, has been carried out of para-substituted aryl groups containing a series of electron-donor substituents. Diarylpicrylhydrazines containing electron-acceptor substituents have been prepared by electrophilic substitution reactions carried out at some stage of this sequence. The conditions for electrophilic substitution reactions in triphenylamine have been worked out, and the structures of the products determined. Some of these tertiary amines, and others prepared from the secondary amines by displacement of iodide from substituted aryl iodides, have been converted to the aminium salts. The visible-U. V. spectra and the electron spin resonances of polycrystalline solids and dilute liquid solutions of these two series of radicals have been studied. In general, electron-donor and electron-acceptor substituents affect a physical property of the hydrazyl radicals in opposite senses, while they affect the physical properties of aminium salts in the same sense. These results are consistent with a proposed structural explanation of substituent effects in stable organic free radicals. (Author) (See also PB 148 976)

Physical Chemistry

ANL-6320 $0.50

Argonne National Lab., Ill.
THE DIFFUSION OF CHROMIUM IN GAMMA URANIUM, by S. J. Rothman. Rept. on Contract W-31-109-eng-38. June 61, 17p.

NAA-SR-MEMO-5785 $1.10

Atomics International, Canoga Park, Calif.
EVAPORATION RATE STUDIES, by H. Hanlin. 16 Oct 60, 9p.

NAA-SR-MEMO-3818 $2.60

Atomics International, Canoga Park, Calif.
OXIDATION OF ZIRCONIUM: A REVIEW, by H. Shimizu. 5 May 59, 21p.

NAA-SR-MEMO-5686 $1.10

Atomics International, Canoga Park, Calif.
PERMEATION RATES OF HYDROGEN THROUGH METALS AND CERAMIC-COATED METALS AND ALLOYS, by Marianne J. Chapman. 13 Aug 60, 7p.

NAA-SR-6382 $0.50

Atomics International, Canoga Park, Calif.
THERMAL DIFFUSION IN INTERSTITIAL SOLID SOLUTIONS, by D. O. Raleigh and A. W. Sommer. Rept. on Contract AT(11-1)-GEN-8. 30 July 61, 22p.

PB 152 408 $8.10

Duke U., Durham, N. C.
OPTICAL CROSS SECTIONS OF RESONANCE LINES EMITTED BY FLAMES UNDER CONDITIONS OF PARTIAL THERMAL IONIZATION [AND] MICROWAVE DETERMINATION OF ELECTRON CONCENTRATIONS IN FLAME GASES USED AS A SPECTROSCOPIC LIGHT SOURCE, by Fritz W. Hofmann, Hedwig Kohn, and Jurgen Schneider. Technical rept. no. 14 on Contract Nonr-1181(05). 15 Sep 60, 82p. 31 refs. AD-245 521.

DESCRIPTORS: *Flames, *Spectrographic analysis, Ionization, *Alkali metals, Microwaves, Attenuation, Additives, Electrons, *Spectrographic data, *Alkaline earth metals, Molecular structure.

A method for determining optical cross sections, based on finding the point of intersection of the low and high density asymptotes of an intensity-density curve, is extended to elements of low ionization potentials. For the

alkaline earth elements the existence of equilibrium ionization is tested for by direct, independent measurements of the partial pressures which enter into the Saha equilibrium quotient. Optical cross sections are measured for the resonance lines of Li, Na, K, Rb, Ca, Cs, Sr, and Ba. The values for the alkalis exhibit a moderate increase with atomic weight which is in accordance with the Weisskopf-Lindholm theory of impact broadening. Measurements of the attenuation of a microwave beam upon crossing a column of flame gases were performed, and electron concentrations in an acetylene-air flame (T = 2500 degrees K) containing one or mixtures of two alkali elements were obtained. The results indicate that the ionization of the elements were obtained. The results indicate that the ionization of the metallic flame additives is thermally equilibrated in the flame zone chosen for the optical line intensity measurements. (Author)

PB 152 116 $4.60

Massachusetts Inst. of Tech., Cambridge.
BURNING VELOCITIES OF THE HYDROGEN PEROXIDE DECOMPOSITION FLAME, by Charles N. Satterfield and Ephraim Kehat. Rept. no. 56 on Contract Nonr-1841(11). 15 Sep 60, 44p. 41 refs. DSR no. 7476; AD-243 582.

DESCRIPTORS: *Hydrogen compounds, Peroxides, *Combustion, Decomposition, *Flames, Velocity, Measurement, Vapors, Solutions.

Burning velocities of the hydrogen peroxide decomposition flame have been measured by the bunsen burner method at pressures between 0.5 and 1 atmosphere. The flame reaction follows approximately first order kinetics with an activation energy of 35 kcal/mole, and shows general agreement with the mechanism and kinetics of the homogenous non-flame reaction. A single plot of the logarithm of the product of the square of the burning velocity and the pressure versus the reciprocal flame temperature correlated the data obtained at all pressures and also burning velocities above liquid solutions of H_2O_2. This covers a 200-fold range of burning velocity. The burning velocity was also correlated with quenching distance and some approximate blow-off and flash-back limits are also given. (Author)

NYO-8779 $1.10

Pennsylvania State U, University Park.
DITHIO- AND SELENOTHIOPHOSPHORUS COMPOUNDS AND THEIR COMPLEXES WITH NICKEL, by D. Karipides and W. C. Fernelius. Rept. on Contract AT(30-1)-907. Apt 61, 11p.

PB 152 072 $9.60

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
DEVELOPMENT OF NEW CRITERIA OF REACTION MECHANISMS. THE MECHANISM OF THE TERT.-ALCOHOL-OLEFIN INTERCONVERSION (PART I). ENTROPIES OF REACTION TRANSITION STATES (PART II). SALT EFFECTS OF AQUEOUS ELECTROLYTES ON THE ACTIVITY COEFFICIENT OF t-BUTYL CHLORIDE AND ITS SOLVOLYSIS TRANSITION STATE (PART III) by Robert W. Taft, Jr. Final rept. on Contract Nonr-656(03). Sep 60, 119p. 128 refs. AD-243 518.

DESCRIPTORS: *Chemical reactions, Alcohols, Ethylenes, Entropy, Thermodynamics, Thermochemistry, Solubility, Decomposition, Butanes, Chlorides, Electrolytes, Activity coefficient, Reaction kinetics.

PART I: The following topics are discussed: olefin isomerization and H-D exchange, solvent isotope effect on dehydration rate, effects of structure on reactivity (hydration and dehydration rates, O^{18} exchange rates, and inductive effects), entropies of activation, effects of ring size on olefin hydration rates, leaving group effect on substitution elimination rates, transition state for olefin-alcohol interconversion, mechanism of O^{18} exchange of alcohols, the reaction coordinate diagram, and the correlation of rates and equilibria by structural parameters. PART II: The effect of structure on the absolute entropy of an aqueous reaction transition can be obtained from the experimental quantities $(\Delta S^{\neq} - \Delta S^{\neq}_{o})$ and $(S_{(g)} - S_{o(g)})$, where $S^{\neq}$ and $S^{\neq}_{o}$ are the absolute entropies of the aqueous and standard transition states, respectively, and $(S_{(g)} - S_{o(g)})$ is the effect of structure on the absolute entropy of the gaseous reactants. PART III: Electrolytes affected both the ground and transition state activity coefficients of tertiary butyl chloride, according to the Setschenow equations: $\log f_g = K_g C_s$ and $\log f_{\neq} = K_{\neq} C_s$; respectively. The salt effect parameter for the ground state, K_g, was positive (salting-out) for virtually all of the electrolytes investigated. Electrolytes had a variable salting-in and salting-out effect on the transition state.

PB 171 950 $0.75

Princeton U., N. J.
DIFFERENTIAL THERMOMETRIC TITRATIONS AND THE DETERMINATION OF HEATS OF REACTION, by Bruce C. Tyson, Jr., W. H. McCurdy, Jr. and C. E. Bricker. Rept. on Contract AF 49(638)467. May 61, 23p. 30 refs. Technical rept. no. AFOSR-762.

DESCRIPTORS: *Heat of reaction, *Titration, Thermistors, *Chemical reactions, *Hydrochloric acid, Butanols, Amines, Methyl radicals, Ammonia, Sodium compounds, Hydroxides, Methanes, Pyridines, Propanes.

A differential apparatus is described that permits accurate thermometric titrations. Temperature-sensing devices (thermistors) are placed in both the sample and blank solutions, thus extraneous heat effects, such as those of stirring and heats of dilution, are minimized. The apparatus was used to follow 14 different reactions and the heats of the reactions were calculated for eleven of them. Although the accuracy of titration depended on the sample size and on the particular reaction under investigation, acid-base titrations were usually accurate to well within 1%. The following heats of reaction with hydrochloric acid at 25°C were determined (values are expressed in K cal/mole): 2-amino-1-butanol -12.82±0.10; 2-methyl-2-amino-1 propanol -13.38±0.10; 2-methyl-2-amino-1,3-propanediol -12.43±0.10; silver nitrate -15.70±0.20; sodium hydroxide -13.45±0.07; ammonia -12.57±0.09; ethanolamine -12.10±0.28; pyridine -4.67±0.07; ethylenediamine, 1st NH_2 -12.38±0.18 and 2nd NH_2 -10.83±0.11; and tris-(hydroxymethyl)-aminomethan -11.89±0.10.

TID-12638 $8.60

Rensselaer Polytechnic Inst., Troy, N. Y.
THE EFFECT OF RARE-EARTH ELEMENTS ON THE ALLOTROPIC TRANSFORMATION OF ZIRCONIUM, by James C. Uy, Daniel J. Lam and others. Final rept. on Contract AT(30-1)-2159. Apr 61, 92p.

EARTH SCIENCES

AD-255 896 $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THEORETICAL CONSIDERATIONS IN THE DESIGH OF ATMOSPHERIC TEMPERATURE-SENSING ELEMENTS, by William C. Barr. Apr 61, 14p. 4 refs. USASRDL Technical rept. 2195.

This report released for sale to the public 14 Aug 61

DESCRIPTORS: Theory, *Atmosphere, Temperature, Measurement, Aluminum coatings, *Thermistors, Sounding rockets, *Upper atmosphere, Errors, Aerodynamic heating, *Temperature sensitive elements, Mathematical analysis, Heat transfer, Thermal radiation

The basic equation for the behavior of an atmospheric temperature-sensing element is formulated and solved. The theory is then applied specifically to an aluminum-coated bead thermistor 0.01 inch in diameter, which is being used with a rocket sounding system to measure temperature in the upper atmosphere. The steady-state errors due to radiation and aerodynamic heating and the time constant are given for this element in the altitude region of 30 to 58.1 kilometers. (Author)

PB 152 558 $11.00

Pacific Science Board, National Research Council, Washington, D. C.
ATOLL RESEARCH BULLETIN NOS. 72-74. Rept. on Contract N7onr-2300(12). 15 Oct 60, 141p. 45 refs. AD-244 599.

DESCRIPTORS: *Geography, *Agriculture, Micronesia, Pacific islands, Culture, Analysis.

Contents;
Bull. 72. Tarawa Atoll, Gilbert Islands, by Edwin Doran, Jr.
Bull. 73. Some aspects of agriculture on Tarawa Atoll, Gilbert Islands, by R. R. Mason
Bull. 74. Birds of the Gilbert and Ellice Islands Colony, by Peter Child.

KY-373 $0.50

Union Carbide Nuclear Co., Paducah, Ky.
VARIATIONS IN ISOTOPIC CONTENT OF NATURAL URANIUM, by R. F. Smith, R. E. Eby, and C. W. Turok. Rept. on Contract W7405-eng-26. 26 June 61, 9p.

PB 157 279 $10.10

Woods Hole Oceanographic Institution, Mass.
ON THE NATURE OF ESTUARINE CIRCULATION. PART I (CHAPTERS 3 AND 4), by Henry Stommel and Harlow G. Farmer. Technical rept. on Contract N6onr-27701. Oct 52, 130p. Ref. no. 52-88; AD-9368.

This report released for sale to the public 15 Aug 61.

Descriptors; *Estuaries, Hydrodynamics, Turbulence.

Chapter 3 qualitatively reviews the hydraulics of stratified flow, treating both 1- and 2-layer flows. Numerical examples are given for several types of estuaries. Chapter 4 summarizes several published papers on estuarine mixing. The results of these papers are based on special hypotheses involving only certain estuaries.

Climatology and Meteorology

PB 155 243 $4.60

Massachusetts Inst. of Tech., Cambridge.
RADAR MEASUREMENT OF THE SPECTRA OF TURBULENCE IN THE FREE ATMOSPHERE, by John D. Stackpole. Research rept. no 32 on Weather Radar Research, Contract DA 36-039-sc-75030. Aug 59, 46p. 24 refs. AD-248 642.

DESCRIPTORS: *Meteorological radar, *Wind, *Precipitation, Radar signals, Measurement, Turbulence, Spectrographic analysis, Gusts, Atmosphere,

Relative motion of precipitation particles causes fluctuations in a radar signal reflected from a number of such scatterers. The fluctuations contain information about the wind structures in the volume sampled by the radar since the wind causes the relative motions The output of the R-meter a device which measures the rates at which the fluctuating signal crosses a specified voltage level, measures the standard deviation of the relative gust velocity distribution within the sampled volume and, as such is a measure of the intensity of the turbulence. Harmonic analysis of the R-meter record reveals that the turbulent intensity at various altitudes from 600 to 18,000 ft varies periodically with a frequency near 0.005 c. The shape of the turbulence spectra are compared with the theoretical shape predicted by the Kolmogoroff theory of turbulent energy decay, but no significant agreement is found. The location of the spectral maxima, combined with measurements of the wind, gives evidence that the rainy atmosphere is composed of an array of relatively more and less turbulent regions transported with the wind. The dimensions of the array are on the order of 11,000 ft in agreement with measured convective cell sizes, which implies that they may well be caused by convective processes present even in stratiform rain. (Author)

PB 154 499 $6.60

Texas A. and M. Coll., College Station.
TESTING A HYPOTHESIS CONCERNING THE QUANTITATIVE DEPENDENCE OF EVAPOTRANSPIRATION ON AVAILABILITY OF MOISTURE, by Winton G. Covey. Research rept. no. 1 on Design of Experimental Meteorological Simulators, Contract DA 36-039-sc-74975. Dec 58, 64p. 29 refs. Reference 58-31T; AD-231 115.

DESCRIPTORS: *Soils, *Evapotranspiration, Plants, Moisture, Quantitative analysis, Theory, Meteorological data, Heat transfer, Simulation

The necessity of a surface-moistness parameter and relationship to complete the mathematical model of evapotranspiration based on the energy balance and energy transfers is discussed. Elaboration is made on an hypothesis that evaporative heat flux is proportional to surface vapor-pressure deficit, the constant of proportionality serving as a measure of surface moistness. The necessary assumptions are made on other unresolved questions so that this surface-moistness hypothesis may be tested against the data of Project Great Plains (at O'Neill, Nebraska, in August and September 1953). Values of the surface-moistness parameter derived for the seven general observation periods show a reasonable relationship to soil-moisture content. Values of surface moistness in the range 0.31×10^{-4} to 8.45×10^{-4} (cal/cm^2 sec mb) are reported. (Author)

ENGINEERING

PB 154 699 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
FUEL-TRANSFER PONTOON BARGE, by J. J. Traffalis. Final rept. 2 Aug 60, 16p. 9 refs. Technical note N-391; AD-250 646.

DESCRIPTORS: *Barges, Fuels, Transportation, Design

NCEL designed a 10,000-gallon fuel barge for use during amphibious operations. It consists of a 3 x 12 NL pontoon barge which stores fuel in the middle eight pontoons of its center string. This report describes NCEL efforts toward the design and fabrication of the Pontoon Fuel Barge prior to termination of the task by the Bureau of Yards and Docks. (Author)

Aeronautical Engineering

PB 157 270 $2.60

[Flight and Engineering Test Group] Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
LANDING FLARE CALCULATIONS FOR HIGH SPEED AIRCRAFT, by Ruediger E. Kosin. Rept. on Correlation of Aerodynamic Data. May 55, 22p. WADC Technical note 55-68; AD-74 787.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Airplane landings, *Aerodynamic data, Analysis, Lift, Drag, Flight speeds.

A procedure has been developed which permits the rapid calculation of the landing flare distance for a minimum 'operational' landing of a typical high speed aircraft. The landing is called operational because it has been conservatively assumed that the pilot at no time uses more than 75 percent of the maximum available normal acceleration during the transition phase. The touch down speed is assumed equal to the minimum attainable at a given gross weight, and the distances computed are, therefore, believed to represent a practical minimum. (Author)

PB 157 272 $18.00

Hughes Aircraft Co., Culver City, Calif.
ROTOR WHIRL TEST TOWER DESIGN STUDY, by T. J. Coyle. Final technical rept. on Contract AF 33(616)346. 7 Dec 53, declassified 15 Dec 53. 285p. 68 refs. Rept. no. DX-O-1; AD 33 239.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Jet helicopter rotors, Test facilities, Gas generating systems Instrumentation, Hydraulic systems, Control systems, Towers.

This design study was conducted to establish the requirements for a complete facility for the whirl testing of large pressure-jet-powered rotors. The facility would provide a whirl tower, gas generating system, rotor and power plant control system, a system for measuring the significant components of rotor force, a system for measuring the rotor power plant power output, test data recording system, rotor handling and maintenance equipment, and related operational equipment. In addition to these basic requirements the following data was prepared: cost estimates of the entire facility and of various components, a cost comparison of two tower height ranges, operating procedures, and a comparison of three types of gas generating systems. From the results of this study it is apparent that the major portion of the initial cost of this facility will be in the gas generating system and that the cost of the tower structure is of secondary importance. Consequently, the major difference between a low tower with rotor in 'ground effect' and a high tower with rotor out of 'ground effect' will be in the cost of rotor maintenance and handling equipment. In general it has been determined that the rotor whirl tower test facility is feasible using available equipment and normal construction practices. It has also been determined that valuable operational data for large pressure-jet-powered rotors can be obtained by this method of testing. (Author)

PB 171 933 $2.50

Lear, Inc., Santa Monica, Calif.
DEVELOPMENT OF A MINIMUM AIR NAVIGATION SYSTEM. Final engineering rept. on MAN (Minimum Air Navigation System), Contract FAA/BRD-115. Oct 60, 116p. ADR-516.

DESCRIPTORS: *Radio navigation, Radio equipment, *Navigation, Air traffic control systems, Design, Simulation, Tests.

The airborne system makes use of any of three types of ground correction signals, though they are not used simultaneously or interchangeably during any one mission. The ground correction signals used are: (a) Two VOR Systems; (b) One VORTAC System; (c) One VOR System. Simulation of the dual VOR ground signal inputs showed satisfactory navigation data could be extracted from noisy radio information by the data-weighting filter to produce reliable, long-term course information. Also, the system will operate without the data being degraded by sudden wind gusts during flight - assuming proper setting of the wind servo gains. In single VOR operation, the simulation revealed that winds caused unacceptable orbiting about the station; however, performance considerably improved when the range computer was used. With the range computer, single VOR

operation of the MAN system is within acceptable bounds. Of the three ground correction signal sources available, the MAN system performance was clearly superior when VORTAC signals were used. Wind responses and the effects of Gaussian noise showed that VORTAC ground signals provided consistently better system performance. (Author)

AD-257 874 $1.50

National Aviation Facilities Experimental Center, Atlantic City, N. J.
DEVELOPMENT OF CRASH-RESISTANT AIRCRAFT FLAMMABLE FLUID SYSTEMS. PART IIA: SPECIFICATIONS FOR PROTOTYPE FITTINGS FOR BLADDER TYPE FUEL TANKS, by John H. Clark. May 60, 54p. 6 refs. Task no. 59-203. 8; Proj. 9-89-02-000.

DESCRIPTORS: *Fuel tanks, *Valves, Design, Specifications, Tests, Fuel cells, Aviation accidents, Aircraft.

Simulated crash tests were conducted under controlled conditions on aircraft fuel cell experimental hardware. In these tests the crashworthy design and performance features were developed for aircraft crash-resistant fuel cell prototype shutoff valves and breakaway tiedown accessories. (Author)

PB 157 271 $1.60

Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
ESCAPE FROM HIGH PERFORMANCE AIRCRAFT, by John W. Goodrich. 9 Jan 56, 17p. 4 refs. WADC Technical note 56-7; AD-81 562.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Ejection seats, *Deceleration, Acceleration tolerance, *Bailout, Aircraft.

An objective analysis of the problem of escape from high performance aircraft is presented in terms of human tolerance to acceleration correlated with pertinent aerodynamic and physical factors. The maximum linear deceleration experienced during escape is computed for the conventional ejection seat system as a function of calibrated airspeed, altitude, and Mach number. The decay of deceleration is also computed as a function of altitude for a given initial calibrated airspeed. Correlation of these computed physical forces with human tolerance to acceleration reveals the critical human limitations associated with existing conventional ejection seats for successful escape from high performance aircraft. This study will aid in determining the scope of knowledge required to support escape systems research and development.

Chemical Engineering

PB 171 934 $2.75

Battelle Memorial Inst., Columbus, Ohio.
STUDY AND FIELD EVALUATION OF SOLAR SEA-WATER STILLS, by J. W. Bloemer, R. A. Collins, and J. A. Eibling. Summary rept. 20 Jan 58-31 Jan 60, on Contract 14-01-001-108. Sep 61, 134p. 6 refs. Saline Water Research and Development Progress rept. no. 50.

DESCRIPTORS: *Solar energy, *Sea water, Distilling plants, *Desalination, Instrumentation, Evaporation, Costs, Design, Construction.

A solar sea-water distillation research station was built in 1958 on the United States Coast Guard's Ponce de Leon Lighthouse Reservation near Post Orange, Florida, to provide facilities for evaluating solar stills under field conditions. A 2500-square-foot Löf glass-covered deep-basin still and two Du Pont air-supported plastic stills of 500 and 2300 square feet were constructed and operated for approximately 1 year. The stills are extensively instrumented to facilitate evaluation of their performance. The evaluation program included acquisition of daily production and efficiency data and compilation of complete energy-balance data with which it is possible to determine the magnitude of the various heat losses. The results of the performance tests showed that the productivity of the basin-type stills was almost entirely dependent upon the intensity of the solar radiation and that it was not affected appreciably by weather conditions. There was little difference in the performance of the deep-basin and the air-supported stills when both stills were in good operating condition, that is, free of distillate leaks. Overall thermal efficiencies were generally in the range of 25 to 35 per cent.

PB 171 929 $1.50

Electric Storage Battery Co., Yardley, Pa.
INVESTIGATION AND DEVELOPMENT OF AN ELECTROLYTIC SYSTEM FOR THE CONVERSION OF SALINE AND BRACKISH WATERS, by Carl F. Norberg. Rept for 31 Jan 61 on Contract 14-01-001-190. Aug 61, 56p. 1 ref. Research and Development progress rept. no. 51.

DESCRIPTORS: *Desalination, *Sea water, Water, Purification, Membranes, Electrolysis, Electrolytic cells, Water supplies, Purification, Costs, Ion exchange resins.

Two kinds of materials possessing both ion exchange activity and electronic conductivity were prepared. Electrolytic regeneration of these materials was less economical than electrolytic regeneration of a conventional resin. Chemical regeneration of the conventional resin was most effective and economical. A so-called membrane type "mixed bed" was constructed and was shown to be capable of desalting sodium chloride solutions in the brackish water concentration range. Energy consumption per unit volume of water treated was considerably higher than for desalting with conventional multiple membrane electrodialysis units.

PB 155 551 $19.75

Michigan U. [Research Inst.] Ann Arbor.
THE ATTENUATION OF THERMAL RADIATION FROM SPHERICAL AND HEMISPHERICAL SOURCES WITHIN AND PARTIALLY WITHIN DISPERSIONS OF OIL PARTICLES, by Stuart W. Churchill, Jin Ham Chin and others. Final rept. on Contract DA 18-108-cml-5515. Oct 56, declassified 6 Feb 61. 306p. 16 refs. 2277-14-F; AFSWP-752.

DESCRIPTORS: Spheres, Hemispherical shells, *Thermal radiation, Attenuation, *Oils, Particles, Scattering.

The attenuation of radiation from spherical and hemispherical sources by plane-parallel dispersions of infinite lateral dimensions was investigated experimentally and theoretically. Dispersions composed of uniformly-sized, nonabsorbing particles and bounded by one partially reflecting surface were considered. The hemispherical sources were all centered on the partially reflecting boundary. Hemispherical sources entirely within and partially within and spherical sources entirely within, partially within, and entirely outside the dispersion were all considered.

PB 155 638 $22.50

Office of Saline Water, Dept. of the Interior, Washington, D. C.
ONE MILLION GALLON PER DAY MULTISTAGE FLASH DISTILLATION SEA WATER CONVERSION PLANT AT SAN DIEGO, CALIFORNIA. Rept. on Contract OSW 14-01-001-195. 18 Oct 60, 447p. Specifications no. 198.

DESCRIPTORS: *Sea water, Desalination, *Distilling plants, Specifications, Water, California.

PB 155 637 $13.50

Office of Saline Water, Dept. of the Interior, Washington, D. C.
ONE MILLION GALLON PER DAY MULTISTAGE FLASH DISTILLATION SEA WATER CONVERSION PLANT AT SAN DIEGO, CALIFORNIA. Rept. on Contract OSW 14-01-001-198. 18 Oct 60, 196p. Specification no. 198, Appendix A.

DESCRIPTORS: *Sea water, Desalination, *Distilling plants, Specifications, Water, California.

PB 171 930 $2.75

Resources Research, Inc., Washington, D. C.
SURVEY OF PHYSIOLOGICAL MECHANISMS OF SODIUM AND CHLORIDE ION TRANSPORT AND DESIGN OF EXPERIMENT FOR APPLICATION TO DEMINERALIZING SALINE WATERS (PART I). LABORATORY EVALUATION OF USE OF ALGAE IN SALINE WATER CONVERSION. PHASE I FINAL REPORT (PART 2). Rept. on Contracts 14-01-001-96 and 14-01-001-109. Sep 61, 127p. 176 refs. Research and Development progress rept. no. 52.

DESCRIPTORS: *Sea water, Water, *Desalination, Sodium compounds, Chlorides, Ions, *Algae, Physiology, Metabolism, Salts, *Electrolytes (Physiology).

Medical, biochemical and physiological literature was searched for information regarding natural processes by which salt gradients are established and maintained between organisms and their environment. Emphasis was placed on functions of the kidney in absorbing electrolytes; on the salt-conserving action of the sweat and secretory glands, intestinal micosa, gills of fish and the skin of amphibians; and on the accumulation and excretion of salts by plants, single-celled organisms, and tissue cells. As a result of the information thus obtained a method was devised for using unicellar algae to remove sodium and chloride ions from sea water. The algae are grown in sea water under optimum conditions for accumulating sodium chloride. They are then removed to an environment where the source of metabolic energy (e. g., light) necessary to maintain their internal salt concentration is denied them. After they have dumped their salt they are returned to the original suspension under conditions for accumulating more salt. A laboratory evaluation of the process was inconclusive. Although many species of algae showed good growth and the ability to concentrate sodium, chloride, or both in 25, 50, 75, and 100% sea water, the final medium in several tests showed more sodium or chloride than at the start of the tests. (Errors in measurement are believed to be responsible.) Results suggest that algae for protein may be grown in sea water, or that possibly some sea water can be used for irrigation.

Civil Engineering

PB 171 941 $1.75

Army Engineer Research and Development Labs., Fort Belvoir, Va.
ROUGH TERRAIN CRANE, 20 TON, by James K. Knaell. Rept. for June 59-June 60. 2 Mar 61, 68p. Rept. no. 1668-TR: AD-254 921.

DESCRIPTORS: *Earth moving equipment, Tests, Terrain, Military requirements.

Report concludes that: (1) the test unit has the lifting capability needed for a 20-ton rough terrain crane; (2) the mobility of a crane equipped with the large earth-moving tires is superior to that of standard truck cranes and is a requisite for rough terrain operation; (3) the tire inflation-deflation system is beneficial for rough-terrain travel; (4) remote control of carrier from crane upper is useful; but infrequent use and maintenance characteristics do not justify its existence; (5) mechanical deficiencies were not excessive; (6) the hydraulic cracking system installed on the carrier engine was not satisfactory; (7) the American Hoist & Derrick boom under high loading was excessively stressed; (8) use of the military standard boom on the 20-ton rough terrain crane will satisfactorily fulfill craning requirements and will make use of a standard military item; (9) ease-of-maintenance features must be incorporated on future machines; (10) the utility blade is a useful tool for use in cross-country travel; (11) limited beach testing indicates the crane will fulfill requirements of beach cargo handling; (12) torque convertor rework is necessary to obtain satisfactory maximum travel speed; (13) present outrigger actuation is not adequate, modification is necessary; (14) additional brake capacity is desirable. (Author)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
INVESTIGATIONS OF PHOSPHORUS PENTOXIDE AS A SOIL-STABILIZING MATERIAL, by G. R. Kozan. Rept. for Feb-Dec 58 on Soil Stabilization. Nov 60, 48p. Technical rept. no. 3-455, rept. 4.
Available from U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. $0.50
When supply is exhausted order from OTS $4.60 as PB 154 591.

DESCRIPTORS: *Soils, Stabilization, Materials, *Phosphorus compounds, *Oxides, *Roads.

Laboratory and field tests were made to determine efficacy of phosphorus pentoxide in stabilizing a weak, lean clay to enable it to support specific military traffic. Initial laboratory tests revealed that 5% phosphorus pentoxide plus 0.5% sodium fluosilicate was capable of increasing the compressive strength of a lean clay (soil A) from 24 to 165 psi after 24-hr curing, exceeding established laboratory strength criteria of 100 psi. A test section surfaced with a similar clay (soil B) stabilized with the same materials, constructed on a 4-CBR subgrade, was traffic-tested and failed by loss of surface integrity (cracking) due to inadequate compaction. This was caused by delay between mixing and compacting during which the stabilizer reacted with the wet soil forming hard, low-density agglomerations. Also laboratory tests showed the stabilizer to be relatively ineffective in treated soil B because this soil contained calcium carbonate concretions, which were not present in soil A. (Author)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TESTS ON SUBARCTIC SNOW, by C. A. Blackmon and A. A. Rula. Rept. on Trafficability of Snow. Dec 60, 159p. 2 refs. Technical memo. no. 3-414, rept. 4. Available from U. S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. $1.25.
When supply is exhausted order from OTS $11.50 as PB 154 590.

DESCRIPTORS: *Snow, Trafficability, Vehicle, Tests, Military research, *Snow roads, Tracked vehicles, *Roads.

A total of 39 self-propelled tests were run with tracked and wheeled vehicles at Boulder, Colorado; Fort Church hill, Manitoba, Canada; Kapuskasing, Ontario, Canada; and Houghton, Michigan. In addition, 27 self-propelled, 24 towing, and 8 towed tests were conducted with tracked vehicles at Camp Hale, Colorado. It was concluded that depth of the snowpack appears to be the most important factor affecting trafficability of subarctic snow which is kept soft by the process of sublimation. It is estimated that conventional wheeled vehicles would not negotiate snow deeper than about 25% of the wheel diameter. Snow depth is correlated with vehicle-performance parameters such as rut depth and maximum drawbar pull. It was found that (a) ground-contact pressure is the most improtant vehicle characteristic affecting vehicle performance, and (b) drawbar pull is greater in moist than in dry snow for snowpacks of the same depth and strength. It is recommended that vehicle tests in subarctic snow be continued and that the cone penetrometer be accepted as the most practical field instrument for measuring snow trafficability. (Author)

PB 156 026 $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
BEHAVIOR OF INSTRUMENTED PRESTRESSED CONCRETE PAVEMENT AT NAS LEMOORE, CALIFORNIA, by J. A. Bishop. 16 Mar 61, 37p. 3 refs. Technical rept. R-120; AD-253 430.

DESCRIPTORS: *Pavements, *Concrete, Stresses, Strain gages, Deflection, Instrumentation, Runways, Reinforced concrete, Measurement, Pressure, Load distribution.

Longitudinal and transverse post-tensioning loads and the distribution of these forces along the lengths of tendons were defined by calibrated links or couplers installed in the tendons. Strains induced in the concrete by stressing and existing for several months after stressing were measured by Carlson strain meters embedded in the concrete adjacent to instrumented couplers. A load test resulted in the definition of a deflection pattern and the measurement of pressures under the load. There was apparently a substantial amount of friction between longitudinal tendons and their ducts as indicated by the difference in tendon force between ends and center. Couplers installed in transverse tendons which were encased in rigid ducts and stressed from one end only did not indicate a large friction loss from one end of the tendons to the other. Tendon forces decrease, and compressive strains in the concrete increase, with time under the influence of slab shrinkage and increased pavement temperatures. A load test shows that the six-inch thickness of prestressed concrete pavement is the equivalent of at least eleven inches of conventional concrete pavement. (Author)

AD-258 262 repriced $2.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
COLUMN STRENGTH OF LONG PILES, by J. J. Hromadik. Final rept. 3 May 61, 95p. 22 refs. Technical rept. 133.

DESCRIPTORS: *Foundations (Structures), Beams, Mechanical properties, Failure (Mechanics), Test equipment, Tests, Buckling, Steel, Reinforced concrete, Design, Theory, Deformation, Deflection, Load distribution, Stresses, *Piers, Equations, Statistical analysis.

Full-scale axial load tests were conducted on six different types of commercially available piles to determine their resistance against failure by buckling. A total of seventeen 80-foot specimens, each with an unsupported length of 60 feet or more, were tested under conditions of piles at refusal. A field test tower with a loading system induced axial compressive loads to 440 tons. Tests and results are presented. Application of tangent modulus principles for use in the generalized Euler equation for predicting buckling loads is demonstrated by way of examples. It is concluded that the theory has practical application, and its usage is recommended. (Author)

PB 155 445 $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
METHODS OF SHOTCRETE CONSTRUCTION FOR PERSONNEL SHELTERS, by R. M. Webb. 17 Mar 61, 37p. 7 refs. Technical rept. R-123; AD-253 431.

DESCRIPTORS: *Shelters, *Air raid shelters, *Reinforced concrete, Construction, Costs, Casting.

To evaluate methods for the economical construction of shotcrete personnel shelters, shotcrete arches were cast over various forms: a Quonset arch, a flexible plywood shell, a pneumatic airform, and a compacted earth

mound. Salvageable Quonsets were found to be the most economical. Wet-mix shotcrete containing coarse aggregate was placed which permitted use of conventional concrete mixes. (Author)

PB 155 313 $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif. OUTLINE FOR AN ENGINEERING HANDBOOK FOR CONSTRUCTION IN DEEP OCEAN AREAS, by W. F. Burkart. 23 Feb 61, 10p. Technical note N-400; AD-252 862.

DESCRIPTORS: *Handbooks, *Construction, Underwater equipment, *Ocean bottom, *Structures

PB 155 114 $8.10

Naval Civil Engineering Lab., Port Huneme, Calif. PLASTIC CONCRETE QUALITY CONTROL, by William R. Lorman. 31 Jan 61, 82p. 500 refs. Technical note N-395; AD-252 861.

DESCRIPTORS: *Concrete, Quality control, Test methods, Mixtures, *Bibliography, Cements, Water, Physical properties, Mechanical properties, Plasticity.

The basic philosophy is presented for controlling the uniformity of concrete during the mixing phase. The quality of fresh concrete is fixed by 3 principal features mixing water, mix proportions, and aggregate ratios. The primary factors complementing the 3 principal features are: cement content, water-cement ratio, workability, and unit weight. The highlights of testing methods which hold appreciable promise and various associated approaches are discussed. Three tests (slump, compacting factor, and slope) are recommended for workability measurement and each is compatible with water content of the mix under consideration. Strength is predictable by means of empirical expressions relating water-cement ratio to compressive strength and correlating these with flexural strength. Water-cement ratio of fresh concrete, intended to conform to a predetermined mix design, could be corroborated by electrical resistance methods. Determination of water-cement ratio of any fresh concrete, of unknown mix design, could be determined in about a half hour by Dunagan's analytical procedure. Other methods involving neutron attenuation and X-ray spectrometry for ascertaining the water-cement ratio of any fresh concrete mix appear promising and presumably could be accomplished in less than 10 minutes. A selected bibliography of more than 500 items traces developments, during the past 60 years, in this area of concrete quality control. (Author)

PB 154 698 $6.60

Naval Civil Engineering Lab., Port Hueneme, Calif. PROGRESS IN RADIATION SHIELDING RESEARCH FOR PROTECTIVE SHELTERS, by A. B. Chilton. 23 June 60, 62p. 44 refs. Technical note N-385; AD-250 643.

DESCRIPTORS: *Shelters, Shielding, Design, Atomic bomb explosions, Ducts, Gamma rays, Neutrons, Radioactive fall-out.

The present status of radiation shielding technology is reviewed, with particular emphasis on protection against radiation resulting from nuclear weapons explosions. The exposition, oriented toward an audience of civil engineers, describes the basic concepts and presents brief descriptions of important research work carried out in various institutions in this country during the past decade. An extensive list of source material is provided. (Author)

PB 155 647 $4.60

Naval Civil Engineering Lab., Port Hueneme, Calif. SHIELDING FACTORS FOR UNDERGROUND SHELTERS OF VARIOUS GEOMETRIC SHAPES, by J. C. LeDoux and L. K. Donovan. 5 Apr 61, 46p. 5 refs. Technical rept. R-080; AD-254 344.

DESCRIPTORS: *Shelters, *Underground structures, *Shielding, Radiological warfare, Configuration.

This study investigates the additional nuclear shielding from an isotropic (plane) radioactive gamma source afforded by various shapes of underground curved-roof shelters compared to the basic slab shield. This additional shielding is defined in the form of a dimensionless Geometry Factor which is a function of the physical dimensions and shape of the shelter. Curves are presented from which the Geometry Factors for the underground shelter shapes of spheres, horizontal cylinders, ellipsoids, and vertical cylinders or silos can be obtained with minimum calculations using only the physical dimensions of the shelter and the depth of material above the crown of the shelter. The Geometry Factors thus obtained are independent of material and photon energy except in the case of the silo and can be used as dimensionless factors once the attenuation for a slab shield has been calculated for a particular set of radiological conditions and materials.

PB 154 787 $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif. SUBMARINE HULKS AS PROTECTIVE SHELTERS, by R. F. Swalley. Final rept. 21 Feb 61, 23p. 11 refs. Technical rept. R-128; AD-251 309.

DESCRIPTORS: *Shelters, *Submarine hulls, *Underground structures, Beaches, Personnel, Biological warfare, Chemical warfare, Radiological warfare, Countermeasures.

Various schemes are considered for emplacing a submarine hulk as an underground shelter. The most practical method is to dredge a slip into a beach area, float in the submarine, and cover it with sand. Modifications to the submarine would be necessary before it could function as a shelter. It would be necessary to install a new electrical system, a new entrance, a modified ventilation system, and a renewed air-conditioning unit. The berthing facilities could be readily expanded to include 138 bunks. The over-pressure capacity would be at least 130 psi, with commensurate radiation protection provided by a cover of 8 feet of sand. It is estimated that a submarine hulk could be adequately modified and emplaced for about $60,000. A breakdown of costs is given. (Author)

PB 155 188 $2.60

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
THERMAL EVALUATION OF THE FORCED-AIR COOLED REPACKAGED AN/APS-31 RADAR MODULATOR, by B. Plizak and A. Check. Phase rept. on TED Proj. no. ADC AV-44016. 14 Dec 60, 26p. 4 refs. Rept. no. NADC-EL-6078; AD-253 058.

DESCRIPTORS: *Search radar, Radar equipment, *Modulators, Airborne, Air cooled, Heat exchangers, *Cooling, Reliability, Heat transfer, Electronic equipment, Temperature, Tests, Test methods.

This report describes the results of thermally repackaging an AN/APS-31 radar modulator. The modulator was repackaged by Motorola, Inc., and incorporated a bifunctional air-to-air heat exchanger intimately integrated with the internal electronic components. Included are results of simulated altitude tests, sea level evaluations, and cooling air requirements for maximum flight conditions. (Author)

PB 153 788 $2.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
STUDY OF RADOME AND REFLECTOR FOR ASDE, by J. A. McDonough. Final engineering rept. on Contract AF 28(099)9. Oct 54, 26p. 2 refs. Rept. no. 2390-4; RADC-TR-55-76; AD-72 032.

DESCRIPTORS: *Airport radar systems, *Reflectors, *Radomes, Design, Radar antennas, Antennas.

Surface tolerances on the antenna reflector were investigated. A surface error of ±1/32 inch is allowable, provided that certain conditions are placed on the distribution. An experimental air-inflatable radome was designed, constructed, and tested. The test results indicate that the radome is electrically satisfactory and can be made mechanically practical. (Author)

PB 157 251 $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE LUNEBERG REFLECTOR FOR BISTATIC RADAR ENHANCEMENT, by Stephen T. Bobey, Jr. Rept. on Techniques for Enhancement of Radar Reflection Characteristics, Contract AF 33(616)5078. 15 Aug 59, 47p. 5 refs. Rept. 768-8; AD-231 472.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Radar reflectors, *Radar echo areas, *Radar equipment, X band, *Radar targets, Measurement, *Radar reflections, Design, Effectiveness.

The defocussed Luneberg reflector is treated as a bistatic radar enhancement device. The phase distribution in the aperture is calculated, as are the reradiation patterns. A process is given for the design of the defocussed Luneberg reflector to approximate a desired set of bistatic conditions. The process applies for any frequency or for any size of Luneberg reflector. Bistatic measurements were taken and the theory and design process were verified. (Author)

PB 154 393 $3.60

Applied Research Lab., U. of Arizona, Tucson.
TRANSISTOR DISTRIBUTED AMPLIFIER, by P. H. Rogers and L. H. Enloe. Final rept. 15 Mar 58-1 Feb 59, on Contract DA 36-039-sc-75021. [1959] 35p. 8 refs. AD-217 643.

DESCRIPTORS: *Distributed amplifiers, Design, *Transistors, Impedance. *Transistor amplifiers, Amplifiers.

Emitter degeneration is used to raise the input impedance of transistors so that their application as the active elements in a distributed amplifier configuration follows more along vacuum tube lines. A particular form of degeneration impedance is found to allow the direct interchange of gain for bandwidth and to generally make the transistor circuit behave like a vacuum tube. Design equations for the conventional constant-k distributed amplifier are presented and the experimental results are compared with theory. A new type distributed amplifier is discussed in which the input impedance of a transistor is complemented by a lossless network terminated in a resistance. This process is continued until the complete distributed amplifier is realized. Design equations for this configuration are presented and experimental results are compared with theory. Impedance transforming networks for the final amplifier delivered under this contract are designed for a four-pole Tschebyscheff response and curves are presented to ease the design of such networks. (Author)

PB 150 832 $1.10

Chesapeake Instrument Corp., Shadyside, Md.
RADIATION IMPEDANCE STUDY, Status rept. 31 May-31 Aug 60, on Contract Nonr-3087(00). 12 Sep 60, 9p. CIC rept. no. 122; AD-243 126.

DESCRIPTORS: *Electroacoustic transducers, Transducers, *Impedance, Spheres, Configuration, Design, Tests, Theory, Data, *Acoustic impedance.

Progress is reported on a study of impedance interactions of transducer arrays. A theoretical treatment of the problem in terms of finite, spherical sources is presented, and the results of computations on sample arrays are given. The theoretical approach and the method of computation is believed to be much simpler and more amenable to practical results than previous theoretical treatments of the problem. Measurements of impedance using a specially designed transducer are presented. With the surface-reflected image as the second source, the impedance data agrees well with the theory in terms of absolute magnitude, but the phase angle of the impedance appears to differ by amounts ranging from 10° to 30°. The source of this difference is as yet unknown, but additional measurements are being made. A second transducer is being assembled for direct pair measurements in the near future. (Author)

PB 171 938 $0.75

Electronics Research Lab., U. of California, Berkeley.
ANALYSIS AND DESIGN OF THE SHUNT-SERIES FEEDBACK PAIR, by M. S. Ghausi. Rept on Contract Nonr-222(74). 16 Aug 60, 21p. 2 refs. Rept. no. 112;

IER Series no. 60, Issue no. 307; AD-245 162.

DESCRIPTORS: *Feedback amplifiers, Amplifiers, Transistors, Design, Mathemetical analysis, *Video amplifiers, Tests.

In this report analysis and design of the shunt-series pair feedback amplifier is studied. To obtain a very simple design procedure, the unilaterial model is used for the transistors, and appropriate approximations and assumptions are made. The amplifiers are designed for wide-band video applications, say for two-pole maximally flat magnitude transmission characteristics. Experimental verification of the theory is given for medium-frequency alloy-junction transistors and high-frequency mesa transistors. (Author)

PB 171 937 $0.50

Electronics Research Lab., U. of California, Berkeley.
A NEW FEEDBACK BROADBANDING TECHNIQUE FOR TRANSISTOR AMPLIFIERS, by M. S. Ghausi and D. O. Pederson. Rept. on Contract Nonr-222(74). 24 Aug 60, 17p. 3 refs. Rept. no. 113; IER series no. 60, issue no. 309; AD-246 035.

DESCRIPTORS: *Transistor amplifiers, Video signals, Broadband, Feedback amplifiers, Transistors, Design, Theory, Amplifiers.

A study is made of broadbanding techniques using local feedback in transistor amplifiers. Primary interest in the amplifiers is for low-pass video signal amplification. Attention is focused on the broadbanding effect of feedback rather than other properties. The simplified model is used for the transistor and appropriate approximations and assumptions are made to render simple analysis and design formulas. Experimental verification of the theory is given and a comparison is made with other broadbanding techniques. It is shown that these feedback techniques in addition to other attractive features are also superior in gain-bandwidth product in comparison with the shunt-peaked amplifiers. (Author)

PB 152 412 $5.60

Institute of Research, Lehigh U., Bethlehem, Pa.
PROBLEMS IN NONLINEAR CONTROL SYSTEMS, by Leslie G. McCracken. Final rept. on Contract Nonr-610(04). 30 Sep 60, 57p. 70 refs. AD-243 879.

DESCRIPTORS: Control systems, Synthesis, *Servo systems, *Integral equations, *Operators (Mathematics), Bibliography.

An investigation is presented pertaining to: (1) the comparative performance of linear control systems setting up for reference purposes the synthesis of linear optimal systems using orthonormal functions: (2) the nonlinear operator and integral equation formulation for generalized control systems; and (3) their logical synthesis in noiseless and noisy environments. Butterworth and Tschebyscheff orthonormal functions are established for optimal system design and applied to parallel active filters. The realization of compensation networks for multiloop control systems shows that 3rd-order, or higher, orthonormal functions must be used. The complexity of the logical design forces the programming of a computer, and in its absence a monolevel adaptive control system is the best choice. A single non-linearity is placed anywhere in a generalized control system and the nonlinear operator and integral equations for all subsumed systems are found to be members of a particular class. An analysis of a saturating system shows the weakness of recursive techniques for computational purposes. Synthesis on non-linear elements, filters and control systems is built up from power-series, saturating, and transformational elements. Optimal logical synthesis is extended to monopole nonlinear controls, nonlinear predictor controls for multiple time series, and nonlinear systems handling discrete data. (Author)

PB 171 942 $1.00

Lansdale Tube Co., Pa.
RESEARCH AND DEVELOPMENT OF A 1000 MC GERMANIUM AMPLIFIER TRANSISTOR, by R. L. Luce and Paul E. Deysher. Quarterly progress rept. no. 2 for 1 Oct-31 Dec 60 on Contract DA 36-039-sc-85367. [1961] 31p. Philco no. R 111.1; AD-252 697.

DESCRIPTORS: *Transistor amplifiers, Germanium, Ultra high frequency, *Transistors, Tests, Life expectancy, Design, Amplifiers.

A typical power gain value of 12 db at 1000 mc has been achieved with one group of units through the use of the most optimum diffusion profile so far achieved. This is an increase from a typical power gain value of 7 db at 1000 mc. Modifications in the fabrication of the 1000 mc germanium amplifier transistor helped reduce fabrication problems and increased the number of units available for measurement. An improved solder joint between blank and base window, a more careful control over the composition the solder being plated to the emitter whisker, and elimination of emitter shorting have evolved from the fabrication refinements instituted. The results obtained from initial life and environmental tests using developmental units look promising. (Author)

PB 157 274 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
SOLUTION OF THE APPROXIMATION PROBLEM OF NETWORK SYNTHESIS WITH AN ANALOG COMPUTER, by Stanley Lehr. Rept. on Contract Nonr-292(00). 18 June 53, 40p. 13 refs Rept. no. R-327-53; PIB-263; AD-15 392.

This report released for sale to the public 15 Aug 61

DESCRIPTORS: *Electrical networks, Synthesis, Numerical analysis, *Analog computers.

An electrostatic analog computer was built which is capable of approximating to the real or imaginary part as well as to the amplitude of the required function. The approximating function is described in terms of its pole and zero locations and a multiplicative constant, The poles and zeros are moved around in the conducting medium until the desired immittance is obtained.

The method is one of trial and error, but the amount of computational work is greatly reduced as compared to that normally encountered in the analytical approach to the approximation problem. The perturbation technique, as well as the proper use of the logarithmic transformation, simplifies the approach. The continuous scan feature of the analog makes it possible to observe immediately changes in the approximation, and solutions are obtainable in a short time. The approach from the real part leads to realizable driving-point functions, while economization reduces the number of elements. Small adjustments in the positions of the critical points effected substantial improvements. Approximations were carried out to the transcendental function arising from the input admittance of a shortened transmission line. The synthesized networks gave smaller deviations than known expansions of partial fractions, and the analog gave networks with fewer elements.

PB 152 709 $9.10

Motorola, Inc., Chicago, Ill.
ENGINEERING INVESTIGATION OF TRANSISTOR VOLTAGE AND CURRENT REGULATORS, by R. D. Mohler and R. H. Curtis. Final rept. 1 Oct 56-18 July 58, on Contract DA 36-039-sc-73101. [1958] 109p. 19 refs. AD-204 900.

This report released for sale to the public 16 Aug 61.

DESCRIPTORS: Voltage regulators, Current regulators, Transistors, Design.

A summary of the theoretical and practical circuit analyses is presented along with a detailed discussion of the characteristics, advantages and disadvantages of various circuits, circuit design techniques and semiconductor components. The theory of operation and design of each of the following regulators is presented. (1) Model 1.4 (1.4VDC output at 0 to 2.0 amperes), (2) Model 6.3 (6.3VDC output at 0 to 5.0 amperes), (3) Model 150 (150VDC output at 0 to .15 amperes), (4) Model 500 (500VDC output at 0 to .15 amperes), (5) Hand Crank Generator (GN-43-G) Regulator, and (6) Dynamotor-Alternator (No. 3H1530-1) frequency regulator. These specific designs illustrate the application of the basic design techniques. The practicality of each design is discussed in comparison to other types of regulators for the same purpose.

PB 161 608 $0.75

National Bureau of Standards, Boulder, Colo.
A FIXED FREQUENCY, 9.1 Gc, FIELD INTENSITY RECORDING RECEIVER WITH EXTREMELY NARROW BANDWIDTH, by R. W. Hubbard and J. V. Cateora. June 61, 83p. 5 refs. Technical note 107.

DESCRIPTORS: *Recording systems, *Radio receivers, X-band, Design, Control systems, Amplifiers, Intermediate frequency amplifiers, Servo amplifiers, Power supplies, Oscillators.

A specialized field intensity recording receiver designed to operate in the X-band (9.1 Gc) portion of the radio spectrum is described and its operational characteristics presented. The receiver normally operates on a fixed frequency of 9100.1 Mc but may be operated at ±100 Mc intervals from the nominal, in the band 8.5 to 9.6 Gc. It displays an extremely narrow bandwidth of 45 cps, held by a stable and flat crystal filter element. The latter may be switched out of the system, providing a wider bandwidth of operation to 500 cps. The narrow bandwidth (approximately 5×10^{-7} percent at the X-band frequency) makes possible a high signal-to-noise figure, a desirable characteristic for a receiver used in tropospheric research. The application of the receiver is primarily for remote unattended operation

PB 154 219 $2.60

Naval Ordnance Test Station, China Lake, Calif.
PRECISE-DELAY TRANSPONDER FOR SHIP-TO-SUBMARINE RANGE MEASUREMENTS, by Udene E. Younger. 30 Oct 60, 23p. NOTS TP 2561; NAVWEPS rept. 7580; AD-249 853.

DESCRIPTORS: *Radar beacons, *Range finding, Automatic volume control, Radar echo areas, Submarines, Underwater ordnance, Transducers, Ultrasonics, Range, Measurement, Radar equipment.

The transponder gives more precise range measurements between a surface ship and a submarine than can be obtained by means of echoes reflected from the submarine hull. It is installed on the submarine, and used with an existing ultrasonic transmitter and recording receiver on the ship. A transducer on the submarine receives pulsed acoustic signals and returns other pulsed acoustic signals after a preset delay. The delay prevents interference between the return signal and the echo from the hull. The delay is generated by counting cycles from a crystal-controlled time base, making it not only precise but also flexible, since it is readily adjustable. The range can be computed from the interval between signal emission and return, taking into account the delay time. The report describes the circuitry and performance characteristics of the transponder. (Author)

PB 155 699 $1.10

Raytheon Co., Waltham, Mass.
RESEARCH STUDY FOR IMPROVED OMEGATRON TUBES, by S. Wolsky. Final rept. 1 July-31 Oct 60, on Contract AF 19(604)7409. 21 Feb 61, 7p. S-247; AFCRL-76; AD-254 377.

DESCRIPTORS: Cyclotrons, *Electron tubes, *Mass spectrometers, Particle accelerators, Instrumentation, Electrometers, Recording devices, Radiofrequency oscillators, Filaments, Lanthanum compounds, Borides.

An improved omegatron mass spectrometer was completed. The effort was directed toward the improvement of the instrumentation in order to provide a more versatile and simpler omegatron apparatus. The major innovations involved the use of (1) and electrometer, recorder, and sweep motor combination which provided rapid and sensitive response, and (2) a single band oscillator which simplified the automatic operation of the equipment. (Author)

PB 157 289 $13.00

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.

QUARTERLY PROGRESS REPORT NO. 55 FOR PERIOD ENDING 31 AUGUST 1959, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Rept. on Contract DA 36-039-sc-78108. 15 Oct 59, 185p. 108 refs; AD-230 230.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: Electronics, *Microwaves, *Plasma physics, *Thermoelectricity, *Microwave spectroscopy, *Communications theory, *Data processing systems, *Data transmission systems, *Acoustics, Machine translation, *Nuclear magnetic resonance, Hyperfine structure, *Frequency modulation, Bioelectronics, Speech, Technological intelligence.

Contents:
Physical electronics
Plasma dynamics
Thermoelectric processes and materials
Microwave spectroscopy
Nuclear magnetic resonance and hyperfine structure
Microwave electronics
Frequency modulation
Statistical communication theory
Processing and transmission of information
Artificial intelligence
Statistical thermodynamics
Physical acoustics
Speech communication
Mechanical translation
Communications biophysics
(See also PB 154 199)

PB 171 935 $1.25

Sperry Microwave Electronics Co., Clearwater, Fla. DEVELOPMENT OF A HIGH POWER S-BAND ISOLATOR, by B. J. Duncan and D. R. Taft. Final rept. 15 July 58-15 Nov 59, on Contract DA 36-039-sc-78080. [1959] 41p. AD-231 667.

DESCRIPTORS: *Microwave equipment, *Waveguides, *Ferrites, Broadband, S band, Resonance absorption, Design.

Development and design information is presented for a high-power, resonance-absorption type ferrite isolator operating in the frequency range of 2700 mc to 3700 mc. The theory underlying recent broadbanding techniques as well as some waveguide transmission properties are presented and their applications are illustrated graphically. Other phases peculiar to the art of ferrite isolator design and their relation to the overall problem are considered in detail. Also, typical experimental approaches and solutions are developed. Finally, a photograph of the developed unit is presented with a complete discussion of its design and graphs illustrating its performance. (Author)

PB 152 184 $10.10

Stanford Electronics Labs., Stanford U., Calif. DUAL MODE FILTERING, by L. G. Shaw. Rept. on Contract Nonr-225(38). 26 Sep 60, 123p. 24 refs. Technical rept. no. 2106-2; AD-245 353.

DESCRIPTORS: *Radiofrequency filters, Design, Analysis, Synthesis, Statistical analysis.

This report introduces the idea of a dual - mode (adaptive) filter which consists of two linear subfilters and an input - sensitive decision element which switches between them. Two classes to minimum-mean-square-error filtering problems are investigated. (1) Spectral filtering concerns dual-mode extensions of Wiener filtering of stationary stochastic input processes. (2) Polynomial filtering concerns dual-mode extensions of a modified form of the Zadeh-Ragazzini model for filtering deterministic signals from random noise. The idea of conditional mean square error is used to find the best dual-mode filter for a gaussian signal plus a kind of non-gaussian noise. This noise is generated by random switching between two different gaussian noise processes. Several other forms of multimode spectral filtering are also discussed. Dual-mode polynomial filtering is similarly investigated for a prototype problem and extensions thereof. The classical assumptions are modified so that the filters are constrained to be unbiased estimators over an ensemble of polynomials of a given order, rather than for each polynomial of the given order. (Author)

PB 152 251 $10.10

Stanford Electronics Labs., Stanford U., Calif. THEORETICAL LIMITATIONS OF GAIN AND BANDWIDTH IN WIDE-BAND TRANSISTOR AND ESAKI DIODE AMPLIFIERS, by J. S. Logan. Rept. on Contract Nonr-225(24). 20 Sep 60, 121p. 12 refs. Technical rept. no. 1753-1; AD-243 759.

DESCRIPTORS: *Band-pass amplifiers, *Amplifiers, Design, Theory, Mathematical analysis, *Transistor amplifiers, Diodes, Circuits, Series, Matrix algebra.

An attempt is made to establish rigorously the ultimate limitations on gain and bandwidth of transistor wide-band amplifiers. A primary restriction in the study is that the limitations be derived for amplifiers which are either completely or approximately unilateral. Results are obtained for unilateralized common-base and common-emitter amplifier cascades. A scattering matrix description of the interstage is used, leading to integral constraints upon power gain as a function of frequency. The integrals are evaluated for an idealized power gain response which gives a measure of ultimate amplifier performance in terms of equivalent circuit parameters. Relative merits of common-base and common-emitter amplifiers are discussed. Two examples of transistor amplifier interstage design are presented, showing how closely one can estimate performance in a given situation using the derived limitations. It is also shown how the methods used to derive the limitations lead directly to a design procedure. Gain-bandwidth limitations for Esaki-diode linear amplifiers are derived using the same techniques as for transistor interstages. Three different amplifier types are considered and compared, and a design example is presented. (Author)

AD-258 135 repriced $0.50

Transistor Applications, Inc., Boston, Mass. RESEARCH DIRECTED TOWARD THE STUDY OF LINEAR AMPLIFICATION USING SWITCHES, by A. W. Carlson. Scientific rept. no. 4, 1 Mar-31 May 60 on Contract AF 19(604)4089. July 60, 12p. AFCRL TN-60-1166.

DESCRIPTORS: *Transistors, *Electronic circuits, *Switching circuits, Electronic switches, Power amplifiers, Radiofrequency filters, Low pass filters, Pulse generators, Trigger circuits, Audiofrequency, Audio amplifiers, Design, Mathematical analysis, Pulse modulation.

Research is described on the use of switches as power amplifiers. The switch is controlled by a signal to produce a duration modulated pulse train which is then passed through a low pass filter to recover the amplified signal. The method is capable of high efficiency in conversion of d-c source power to signal power, the efficiency approaching 100% with lossless switches in the proper circuit. The distortion is low if the pulse repetition rate is sufficiently higher than the cut off frequency of the filter and if the signal modulating the pulse train falls in the filter pass band. (Author)

AD-258 138 repriced $0.50

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD THE STUDY, ANALYSIS AND DESIGN OF TRANSISTOR CIRCUITS, by A. W. Carlson. Scientific rept. no. 5, 1 June-31 Aug 60, on Contract AF 19(604)4089. Apr 61, 17p. 1 ref. AFCRL-318.

DESCRIPTORS: *Transistors, *Electronic circuits, Diodes, Impedance, Capacitors, *Switching circuits, Trigger circuits, Design, Mathematical analysis.

A 34 section non-linear line using reverse biased junction diodes for voltage dependent shunt capacitance was constructed. The line is to be usedto investigate problems raised in interpreting the mathematical solution of the lossless, uniform, distributed non-linear line given in AD-238 929. A two transistor free running sawtooth generator having a linear portion and a rapid recycle is described. In one version of the circuit, one of the transistors performs as a blocking oscillator and as an emitter follower to give a low impedance output for the signal. A counter using a closed loop shift register having one inversion in the loop was investigated. This type of operation has advantages at high count rates and also gives a reduction in active elements. (Author)

Ordnance, Missiles, and Satellite Vehicles

NAA-SR-MEMO-4615 $2.60

Atomics International, Canoga Park, Calif.
SATELLITE VEHICLE NATURAL RESTORING TORQUES, by T. E. Kapus. 25 Nov 59, 23p.

UCRL-6343 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
STAGE OPTIMIZATION OF THE GENERAL MULTISTAGE ROCKET, by Robert H. Fox. Rept. on Contract W-7405-eng-48. 16 Feb 61, 15p.

PB 154 220 $2.60

Naval Ordnance Test Station, China Lake, Calif.
ATTITUDE SIMULATION AND ANALYSIS, by Stephen M. Lee. 1 Oct 60, 28p. 3 refs. NOTS TP 2550; NAVWEPS rept. 7574; AD-249 729.

DESCRIPTORS: Attitudes, *Guided Missiles, Errors, Analysis, Simulation, Guided missile trajectories.

A method was developed for generating missile attitude data having random errors of known distribution in the input. The output data is then analyzed and the propagated error investigated. (Author)

PB 154 338 $8.10

Naval Ordnance Test Station, China Lake, Calif.
TABLE OF INITIAL FRAGMENT VELOCITIES CALCULATED FROM GURNEY AND STERNE FORMULAS FOR VARIOUS C/M RATIOS AND EXPLOSIVE ENERGIES, by James A. Weeks. 22 Dec 60, 88p. 1 ref. NAVWEPS rept. 7592; NOTS TP 2581; AD-250 222.

DESCRIPTORS: Explosions, *Fragmentation, Velocity, Determination, Configuration, Tables.

An extensive table is presented of initial fragment velocities as a function of charge-to-metal (c/m) mass ratio and explosive energy ($\sqrt{2E}$), calculated using Gurney Solid Cylinder, Gurney Sphere, Sterne Flat Plate, and Sterne Symmetrical Flat Sandwich formulas. Values of initial velocities are given for c/m ratios in increments of 0.02 from 0 to 3.00 and $\sqrt{2E}$ in increments of 200 fps from 6000 to 10,000 fps for warhead design application. (Author)

PB 156 646 $1.60

Picatinny Arsenal, Dover, N. J.
STUDY OF CRACK PREVENTING ADDITIVES FOR CAST EXPLOSIVES, by D. H. Johnson. Feb 60, 13p. Technical rept. DB-TR: 6-60; AD-232 741.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Explosives, Casting, Additives, Thermal stresses, Temperature, Loading, High explosive ammunition, *TNT, Radiographic analysis, Storage, Surface properties, Fracture (Mechanics).

Optimum percentages of alpha-nitronaphthalene 2, 4, 6 trinitroanisole, and 1, 2, dihydroxybenzene were investigated relative to prevention of cracks due to thermal shock and exudation when added to TNT and Composition B. These additive percentages were previously determined by a laboratory study [AD-203 745] and were evaluated on a larger scale by 155mm, M107, shell loadings with shell bodies at 50° - 62° F for Composition B and 50° - 70° F for TNT for the purpose of inducing cracks by creating thermal stresses in the TNT. The ability of each additive to prevent cracking of the explosive shell casts was determined by radiographs. Exudation was evaluated by subjecting the loaded shell to a high temperature storage test (160°F) for thirty (30) days. Crack prevention and exudation test results were compared in each case with control shell loaded without additives. Test results indicated that the compounds are not effective as crack preventing agents under the test conditions of this study, which represents the temperature cooling water limits at which a practical loading process can be conducted without the use of refrigeration (Author)

Sanitation and Safety Engineering

HW-68435 $2.50

Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1960, ed. by I. C. Nelson. Rept. on Contract AT(45-1)-1350. 1 June 61, 115p.

HASL-109 $0.50

Health and Safety Lab., New York Operations Office, N. Y.
THE ATTENUATION OF NATURAL ENVIRONMENTAL RADIATION BY AN AUTOMOBILE, by Arthur Shambon, Wayne M. Lowder, and Leonard R. Solon. 19 Apr 61, 11p.

AD-258 753 repriced $0.75

Naval Civil Engineering Lab., Port Hueneme, Calif.
LITHIUM HYDROXIDE CANISTERS FOR PERSONNEL SHELTERS, by R. J. Zablodil, J. M. Stephenson, and R. S. Chapler. Final rept. 13 June 61, 25p. 4 refs. Technical rept. R-151.

DESCRIPTORS: Carbon dioxide, *Shelters, *Ventilation *Lithium compounds, Hydroxides, *Blowers, Tests.

A canister-blower device with two lithium hydroxide canisters in parallel was developed to reduce the CO_2 in personnel shelters. Operational instructions are provided, with a chart showing when and how to use the equipment. (Author)

IDO-10036 $1.25

Phillips Petroleum Co., Idaho Falls.
NUCLEAR INCIDENT AT THE IDAHO CHEMICAL PROCESSING PLANT, 25 Jan 61, by R. C. Paulus, A. O. Dodd and others. 1 June 61, 62p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

AD-257 357 repriced $2.75

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HAND BOOK. VOLUME I. GENERAL SYSTEM CONSIDERATIONS, by W. R. Menetrey and J. H. Fisher. Final rept., vol. 1 for Sep 59-Aug 60, on Contract AF 33(616)6791. Sep 60, 136p. 18 refs. EOS rept. no. 390-Final; WADD TR-60-699, Vol. 1.

DESCRIPTORS: *Power supplies, *Handbooks, *Space environmental conditions, Nuclear energy, Solar energy, *Space flight, Guided missiles, Hypervelocity vehicles, Lunar probes, Satellite vehicles, Spaceships, Reliability Meteorites, Fuel cells, Storage batteries, Thermoelectricity, Van Allen radiation belt, Materials, Analysis, Effectiveness, Design, Costs, Cratering, Electromagnetic waves, Particles.

An introduction is presented to subsequent volumes dealing with specific areas of power system technology. General topics useful in evaluating and rating power systems are discussed including the space environment and its effects reliability considerations in systems design figures of merit and their use in system evaluation power needs of the future and the importance of developing power systems and an estimate of expected system weights. Environmental effects include meteoroid bombardment, interplanetary and Van Allen corpuscular radiation, electromagnetic solar radiation, and vacuum. It is shown that the effort needed to guarantee high power system reliability may be too costly. The relative position of nuclear, chemical, and solar power systems in a power level-mission duration continuum is presented. (Author)

AD-257 358 repriced $3.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VI. CHEMICAL SYSTEMS, by W. R. Menetrey and J. Chrisney. Final rept., vol. 6 on Contract AF 33(616)6791. Sep 60, 202p. 79 refs. EOS rept. no 390-Final; WADD TR-60-699, Vol. 6.

DESCRIPTORS: *Power supplies, *Fuel cells, *Primary batteries, *Storage batteries, Electrochemistry, *Space flight, Theory, *Combustion, Electrodes, Generators, Gas turbines, Storage, Dry cells, Nickel, Cadmium, Silver, Zinc, Mercury, *Heat engines, Liquid rocket propellants, Hydrazines, Liquefied gases, Hydrogen, Oxygen, Thermoelectricity.

Power systems which use chemical fuel as the energy source appear useful in a variety of space applications and offer weight advantages for durations below about 100 hours. A discussion is presented on primary and secondary batteries, primary and regenerative fuel cells, reciprocating engines using hydrogen and oxygen bipropellant, monopropellant and bipropellant turbines and cryogenic storage of H and O. The theoretical and practical performance of the converters is reviewed, and the weight of various systems is predicted. Other factors besides power system weight may lead to the selection of a chemical system in preference to others. For example, liquid H provides an excellent heat sink for environmental control. While batteries may be approaching the limits of their capability, major advances still will be accomplished in the fuel cell and dynamic engine area. For durations of more than several hours primary system weights of 1 to 1.5 lb/hp-hr and secondary specific weights of up to 100 whr/lb appear possible by 1970. (Author)

Manufacturing Equipment and Processes

PB 171 940 $1.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
ULTRASONIC WELDING: AN ANNOTATED BIBLIOGRAPHY, by Maureen A. Pearcy. Feb 61, 31p. 58 refs. Special bibliography SB-61-2; AD-252 855.

DESCRIPTORS: *Welding, *Ultrasonics, *Bibliography, Metals, Vibration, Manufacturing methods.

The bibliography presents a review of recent unclassifird literature on the application of ultrasonic vibrations to the welding of various metals. The sources checked

for this material include: (1) holdings of LMSD, Technical Information Center; (2) ASM, Review of Metal Literature, 1958-1960; (3) Engineering Index, 1958-1960; (4) Crerar Metal Abstracts, 1958-1960; and (5) Nuclear Science Abstracts, 1958-1960. The following Russian welding journals are cited: AVTOMATICHESKAYA SVARKA (Automatic Welding) and SVAROCHNOE PROIZVODSTVO (Welding Production). (Author)

PB 157 264 $9.10

Republic Aviation Corp., Farmingdale, N. Y.
FORMABILITY OF INCONEL X, by R. Germann and C. J. Shaver. Final engineering rept. pt. 3, 15 Oct 58-15 Oct 59, on Contract AF 33(600)38042. 30 Nov 59, 110p. 8 refs. Rept. no. MRP 58-71; AMC-TR-59-7-767; AD-233 026.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: Weapons, *Nickel alloys, *Manufacturing methods, Processing, Heat treatment; Mechanical properties; Airframes.

The basic criteria for the forming of Inconel X into typical airframe parts was determined. In addition to studies of the basic fundamentals, investigations uncovered significant features involved in the initial heat treatment and the processing through some of the more sophisticated manufacturing operations. The results indicated that Inconel X is readily usable if certain precautions peculiar to the material are observed. Conclusions: Inconel X has exhibited remarkedly uniform properties in the aged condition; its processing can omit inter-stage stress relieving if elongations do not exceed 15%. Welded components are not included in this category. Almost all forming must be performed in the soft condition. Subsequent thermal processing causes a predictable shrink in part dimensions which should be allowed for in the tooling of large parts. Distortion due to thermal processing is minimum. In general, single-stage forming cannot exceed 37%. The multiple-stage forming extends this range an additional 13% without inter-stage annealing. Thermal processing produces a scale that, in general, does not affect the mechanical properties except fatigue life. (Author)

Transport, Traction and Hoist Facilities

PB 150 990 $7.60

George Washington U., Washington, D. C.
SHIPBOARD ENVIRONMENT OF LOGISTICS, by J. E. Hamilton. Rept. on Logistics Research Project, Contract Nonr-761(05). 21 Sep 60, 78p. Serial T-107/60; AD-243 364.

DESCRIPTORS: *Logistics, Ships, Supplies, *Naval logistics, *Naval supplies, Naval vessels, Naval procurement.

An attempt to establish the facts that: (1) not only is the ship's company basically responsible for determination of what shall be carried on board at any time but the usual ship's company will manage to exercise this responsibility in spite of any imposed authoritative but irresponsible limitation; (2) operating stocks exist in all ships; they may be of great importance to any concept of loading, including endurance loading, and must be recognized in any functional supply system; (3) true usage data do not exist and issue for end use data are faulty as usage data because they are not complete; they are time-skewed; and they do not take account of operating stock inventory changes; and (4) practically all routine usage of material is from operating stocks. (Author)

PB 155 796 $1.60

Naval Ordnance Test Station, China Lake, Calif.
A DEEP-SEA RESEARCH VEHICLE, by Firth Pierce. 27 Mar 61, 20p. NAVWEPS rept. 7627; NOTS TP 2632; AD-254 731.

DESCRIPTORS: *Submarines, *Oceanography, Underwater equipment, Scientific research, Submarine hulls, Ammonia, Instrumentation, Design.

A Deep-Sea Research Vehicle (DRV) is proposed that will be able to cruise at any depth at a 6-knot maximum speed, and will have a 3-knot range capability of 100 miles. The vehicle will carry a crew of three and will be equipped with scientific apparatus for fully exploring the deep-sea environment. Stable buoyancy will be achieved by using a nonflammable solution of ammonia in water. (Author)

MATERIALS

PB 171 954 $2.50

American Machine and Foundry Co., Niles, Ill.
INSTANTANEOUS LOCAL TEMPERATURES OF AERODYNAMIC DECELERATORS. PART II. THERMAL PROPERTIES, by G. Engholm, S. J. Lis, and R. A. Bambenek. Rept. for July 59-Aug 60, on Fibrous Materials for Decelerators and Structures, Contract AF 33(616)6673. Feb 61, 107p. 24 refs. WADD Technical rept. 60-670, pt. 2.

DESCRIPTORS: *Parachute fabrics, Temperature, Nylon, Stainless steel, Glass, Graphite, Heat transfer, Tests, Deceleration.

Measurements were made of the thermal conductivity of the following candidate parachute fabrics: nylon, stainless steel, glass, graphite, and AF-1 (an organic fiber). Data was obtained with a Cenco-Fitch device in which the effects of compressive load was established. A similarity relation derived from dimensional analysis was applied to this data and resulted in a satisfactory correlation. A new apparatus was developed in order to determine fabric conductivity under varying conditions of temperature (212 to 600°F). ambient pressure (15 to 0.048 psia), biaxial tension (0 to 90 ppi), and compression (1 to 10 psi). Initial data collected using the apparatus demonstrated its capabilities and analysis of the data indicate the possibility of further dimensionless correlations may be negligible. Considerably more detailed data will have to be obtained to establish repeatability and verification of these hypotheses. (Author)

AD-255 915 $1.75

Army Chemical Research and Development Labs., Army Chemical Center, Md.
NINTH MATERIALS REVIEW, by Arthur Lyem. Rept. for 5 July 60-3 Jan 61. May 61, 67p. 208 refs. CRDL Special pub. 4-27.

DESCRIPTORS: *Polymers, *Plastics, *Synthetic fibers, *Metals, Strategic materials, Bibliography.

Over 200 articles have been abstracted from various journals. The review has four major headings: (1) high polymers, (2) plastic materials, (3) synthetic fibers, and (4) metals and inorganic materials. (Author)

AD-260 450 $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
A RAPID METHOD FOR DETERMINING ISOPHTHALIC ACID IN ALKYD RESINS, by M. H. Swann. 17 May 61, 9p. 10 refs. CCL # 106.

DESCRIPTORS: *Alkyd resins, Chemical analysis, *Phthalic acids, Determination.

Alkyd resins prepared from polyhydric alcohols and isophthalic acid have attained widespread usage and appear with increasing frequency in synthetic resin enamels either as the sole dicarboxylic acid or with ortho-phthalic anhydride. Isophthalic acid is frequently found in enamels intended to conform with Ordnance specifications but is not permitted as a substitute for the ortho-isomer, and analyses for isophthalic acid are sometimes required. Although qualitative, volumetric and spectrophotometric methods for its detection and analysis have been previously reported from the analytical section of the laboratory, a gravimetric method with special advantages, has been developed for rapid, routine control.

PB 157 230 $9.10

Material Lab., New York Naval Shipyard, Brooklyn, N. Y.
REPORT OF INVESTIGATION OF OUTDOOR WEATHER AGING OF PLASTICS UNDER VARIOUS CLIMATOLOGICAL CONDITIONS, by S. E. Yustein and R. R. Winans. Final rept. 19 Sep 52, 102p. 11 refs. Lab. proj. 4860-G-2.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Plastics, Aging, Climatic factors, Meteorology, Terminal blocks.

The effects of outdoor weather aging under widely different climates are investigated for various types of plastic materials. Five climatological regions are represented in the program which provides for outdoor exposures on sites located in (1) Panama Canal Zone (tropical); (2) New Mexico (dry desert); (3) New York (temperate); (4) Fort Churchill, Canada (subarctic); and (5) Point Barrow, Alaska (arctic). The materials investigated include 5 types of clear transparent sheet plastics, 6 types of laminated materials and 5 types of molded terminal bars. Various exposure periods from 1 to 36 months were employed, and various mechanical, electrical and optical properties were evaluated. On the basis of the extensive data accumulated, it was possible to deduce the occurrence of a wide variety of effects that appear to be related to differences in the climatic and environmental conditions and in the exposure periods. (Author)

PB 157 238 $14.00

Pesco Products Div., Borg-Warner Corp., Bedford, Ohio.
STUDY AND PRELIMINARY EXPERIMENTAL EVALUATION OF MISSILE FUEL SYSTEMS AND COMPONENTS USING LIQUID HYDROGEN. Summary rept. on phase 1, Contract AF 33(616)5810. July 59, 206p. 23 refs. Pesco engineering rept. no. 3094; WADC Technical rept. no. 59-426; AD-234 109.

This report released for sale to the public 15 Aug 61

DESCRIPTORS: *Fluid flow, *Rocket fuels, *Hydrogen, *Liquefied gases, Heat transfer, Fuel tanks, Fuel pumps, Pressure, Thermodynamics, *Guided missiles Induction motors, Design, *Liquid rocket propellants, Rocket motors, Bearings, Seals.

The work included in this report covers the accomplishments during the first year on an anticipated three-year program to study and evaluate SF-1 fuel system flow phenomena and system components needed between the fuel tank and the missile engine high pressure pump. The report includes an analysis of two phase flow in SF-1 transfer lines, a discussion of the fluid conditions in the supply tank, a discussion of the booster pump application to a missile fuel system, and a study of possible methods of measuring vapor-liquid ratio in SF-1. Descriptions of components and test equipment for use in later phases of the program are presented. These include: a single phase flow loop, a 7000 gallon dewar and a 1500 gpm, 250 psi circulation pump for the flow loop. The experimental phases discussed in the report include the performance of a 24,000 rpm booster pump, a 24,000 rpm submerged electric motor drive for a booster pump, and preliminary results on the effect of fluid stratification in a missile tank on the performance of a tank-mounted booster pump. (Author)

AD-259 551 $0.50

Rock Island Arsenal Lab., Ill.
SYNTHESIS OF ELASTOMETRIC POLYESTERS BASED ON DIEPOXIDES, by Ronald R. Freeman. 7 Apr 61, 20p. 4 refs. Rept. no. 61-1403.

DESCRIPTORS: *Polymers, Synthesis, Physical properties, Tests, *Rubber, *Elastomers, *Epoxides, Silicones, Catalysts, Anhydrides, Glycols, Dibasic acids.

Results are presented on (1) homopolymerization of 1, 3 bis[3(2, 3-epoxypropoxy)propyl] tetramethyldisiloxane using various catalysts, (2) reaction of the aforementioned diepoxide with anhydrides, glycols and dibasic acids, and (3) homopolymerization and copolymerization of certain epoxides with anhydrides. Only the reaction of 1, 3 bis[3(2, 3-epoxypropoxy)propyl] tetramethyldisiloxane with phthalic anhydride resulted in an elastic polymer. This polymer was a tacky, low molecular weight rubbery gum that became insolube in aromatic solvents after long term storage at room temperature. Attempts to prepare high molecular weight polyesters from these two monomers were unsuccessful. Vulcanizates based on these experimental diepoxide/anhydride polymers exhibited only fair heat resistance, poor stress-strain properties and poor properties at low temperatures but had excellent resistance to hydrocarbon oils. (Author)

AD-257 823 repriced $2.00

Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF RADIATION ON FERROELECTRIC AND FERRIMAGNETIC MATERIALS. PART I. FERROELECTRIC MATERIALS, by L. G. Wright, C. A. Rosen and S. I. Tainmuty. Final rept., pt. 1 on Contract AF 19(604)4141. 1 May 61, 78p. 19 refs. AFCRL-351.

DESCRIPTORS: *Ferroelectric crystals, *Ferroelectric materials, Barium compounds, Titanium compounds, Oxides, Lead compounds, Calcium compounds, Zirconium compounds, Intermetallic compounds, Ceramic materials, Dielectrics, Dielectric properties, Hysteresis, Radiation damage, Gamma rays, Neutron bombardment, Neutrons, Polarization, Test facilities, Space environmental conditions, Nuclear propulsion, Ferromagnetic materials, Heat treatment, Aging, *Titanates.

The effects of reactor radiation and Co-60 gamma radiation on the dielectric properties of 4 ceramic ferroelectric materials ($BaTiO_3$, 96% $BaTiO_3$ plus 4% $PbTiO_3$, 95% $BaTiO_3$ plus 5% $CaTiO_3$, and 56% $PbZrO_3$ plus 44% $PbTiO_3$) were studied. Complex permittivity and large-signal hysteresis properties were measured before and after irradiation, after room temperature aging, and after 500 C heat treatment. The effects on the dielectric constant were small after fast-neutron exposures below 10 to the 18th power n/sq cm. After 10 to the 18th power n/sq cm, decreases in the values of the dielectric constants were observed with the passage of time. The total hysteresis loss at constant maximum electric displacement increased, and the changes in the hysteresis loops were large only in the samples exposed to 10 to the 18th power n/sq cm. The changes in the γ-irradiated samples were similar to but smaller than those in the neutron-irradiated samples.

Ceramics and Refractories

ANL-6340 $0.50

Argonne National Lab., Ill.
PREPARATION OF HIGH-DENSITY, SPHERICAL THORIUM OXIDE PARTICLES WITH UP TO 10 ATOM PERCENT URANIUM, by C. E. Crouthamel, W. G. Knapp and others. Rept. on Contract W-31-109-eng-38. June 61, 14p.

NAA-SR-MEMO-5989 $7.60

Atomics International, Canoga Park, Calif.
ANALYSIS OF TRANSIENT THERMAL BEHAVIOR OF UO_2 EXPERIMENTAL FUEL ELEMENTS IN THE SRE, AFTER LOSS OF PUMP POWER, by R. P. Varnes. 27 Dec 60, 73p.

NAA-SR-MEMO-6041 $1.10

Atomics International, Canoga Park, Calif.
MICROSTRUCTURAL INVESTIGATION OF HOT PRESSED URANIUM CARBIDES USING EXTREMELY HIGH PRESSURES, by C. G. Rhodes. 16 Jan 61, 10p.

NAA-SR-6331 $0.50

Atomics International, Canoga Park, Calif.
THE OXIDATION OF "REACTIVE" URANIUM CARBIDE, by E. W. Murbach. Rept. on Contract AT(11-1)-GEN-8. 15 July 61, 15p.

NAA-SR-MEMO-5998 $1.60

Atomics International, Canoga Park, Calif.
OXIDATIVE DECLADDING OF UO_2 FUEL RODS, by I. J. Groce and R. J. Sullivan. 28 Dec 60, 16p.

PB 171 948 $1.00

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
THE INFLUENCE OF PRESSURE AND TEMPERATURE ON ZIRCONIUM OXIDE, by F. W. Vahldiek, C. T. Lynch and L. B. Robinson. Rept. for Mar-Sep 60 on Ceramic and Cermet Materials Development. Nov 60, 34p. 28 refs. WADD Technical rept. 60-705; AD-249 765.

DESCRIPTORS: *Ceramic materials, *Zirconium compounds, Oxides, Pressure, Temperature, Phase transitions, Sintering, Density, Porosity.

The effects of temperature and pressure on the monoclinic-tetragonal phase transformation and on the sinterability of superpure zirconia have been studied. Investigations were undertaken at temperature ranges from 1140 to 1800 deg C and at pressures from 310 to 12380 atmospheres. Experiments showed that no tetragonal phase was stabilized after firing and rapid quenching in air, water and liquid nitrogen. The region of transformation was found between 1193 to 1200 deg C. Pressure lowered the sintering temperature of zirconia, and specimens pressed at 9280 atmospheres and fired to 1800 deg C in an inert atmosphere resulted in compacts with a 98.8% theoretical density. Grain refinement was observed with increasing temperature and at various pressures. Average particle sizes of 4 microns and less were found in compacts originally consisting of particles averaging 60 microns. A mathematical equation for the compressibility of zirconia was derived. (Author)

PB 171 939 $0.50

Pennsalt Chemicals Corp., Wyndmoor, Pa.
MAGNESIUM OXIDE IN FIBER FORM BY EXTRUSION METHODS, by Robert A. Florentine, Jos. W. Simmons, and Isadore Mockrin. Technical rept. no. 16 on Contract Nonr-2687(00). Aug 60, 14p. 10 refs. AD-243 205.

DESCRIPTORS: *Ceramic fibers, Magnesium compounds, Oxides, Particles, Extrusion, *Filaments, Fibers.

A technique is described for forming "filaments" of aggregated magnesium oxide particles by extrusion of magnesium oxide dispersed in a magnesium acetate-methanol-water system. These "filaments" can be converted to thermally-stable, hollow "fibers" by heating or by hydrolysis. The thermal insulating properties of this material equal or exceed those of magnesium oxide powder, and the initial poor strength and brittleness can be improved somewhat by subsequent chemical or physical treatment. (Author)

PB 157 278 $3.60

Pennsylvania State [U. Coll. of Mineral Industries, University Park].
A STUDY OF THE THERMAL EXPANSION OF GLASSES, by M. D. Karkhanavala. Technical rept. no. 53 on Contract N6onr-269, T. O. 8. Nov 52, 35p. 12 refs. AD-1298.

This report released for sale to the public 15 Aug 61

DESCRIPTORS: *Glass, Thermal expansion, Ions.

The thermal expansion of simple glasses of widely varying composition was measured to provide a basis for the development of an adequate theory for the expansion. The glasses had the general composition M_2O-RO-xSiO_2, where M was either Na^+, or K^+; R was either Mg^{2+}, Cu^{2+}, Ca^{2+}, Sr^{2+}, Pb^{2+}, or Ba^{2+}; and x was an integer varying from 2 to 6. The borate and alumino-phosphate glasses were of the general composition Na_2O-RO-5B_2O_3 and Na_2O-RO-2.5$AlPO_4$, respectively. Appropriate samples were obtained by melting 50-g. batches in low-Fe kyanite crucibles. The expansion curves up to the softening point were obtained by using either the interferometric or the dilatometric methods. A steady heating rate of 4° C/min. was maintained. The e line of an Hg lamp (λ = 5461A) was used in conjunction with a Gaertner interferometer. The low-temperature expansion of high SiO_2 (greater than 67 mole-%) glasses increases with decreasing field strength of the other cations. The volume difference between chilled and annealed glasses decreases as (1) SiO_2 content is decreased, (2) large cations are substituted for small cations of the same charge, and (3) nonnoble gas-type cations replace noble gas-type cations of similar size and the same charge. The electron configuration of a cation does not appreciably affect the low-temperature expansion of a high-SiO_2 glass but does affect low-SiO_2 glasses. The ratio of the expansivity after and before the critical range is a maximum around 67 to 70 mole-% of SiO_2. The thermal expansion is approximately additive for glasses with more than about 70 mole-% SiO_2.

Wood and Paper

PB 154 506 $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
CHROMATOGRAPHIC ANALYSIS OF EXTRACTED CREOSOTE OILS, by Richard W. Drisko and Harry Hochman. 30 Jan 61, 4p. 6 refs. TN-403; AD-250 700.

DESCRIPTORS: *Marine borers, *Creosote, *Oils, *Chromatographic analysis, Resistance, Wood, Piers.

The object of this task is to develop materials and techniques for treating timbers to prevent marine borer attack. A number of creosote oils extracted from marine piling which have shown great differences in their resistance to attack by marine wood boring organisms have been analyzed chromatographically for saturated hydrocarbon content. (Author)

PB 155 063 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF TEMPERATURE ON THE BORING ACTIVITY OF LIMNORIA, by H. P. Vind and H. Hochman. Final rept. 7 Mar 61, 18p. 9 refs. Technical rept. R-117; AD-252 065.

DESCRIPTORS: *Wood, Harbors, Piers, Floating docks, Climatic factors, Structures, *Marine borers, Marine engineering, Temperature, Life expectancy, Deterioration.

The laboratory has been seeking to better understand the reasons for differences in the service life of marine timbers in various localities and to resolve the factors that determine how long a preservative will function. Experiments were performed to determine the effect of temperature on boring activities of cold, temperate, and warm-water species of Limnoria. It was concluded that timbers exposed to a marine environment in cold-water harbors (Limnoria lignorum territory) are subject to Limnoria attack in midsummer only; timbers exposed in temperate-water harbors (Limnoria quadripunctata territory) are subject to Limnoria attack throughout the summer; and those exposed in warm-water harbors (Limnoria tripunctata territory) are subject to extensive Limnoria attack throughout the year. (Author)

MATHEMATICS

PB 152 362 $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
APPLICATION OF THE METHOD OF THE KERNEL FUNCTION FOR SOLVING BOUNDARY VALUE PROBLEMS, by Stefan Bergman and John G. Herriot. Technical rept. no. 8 on Contract Nonr-225(37). 1 Sep 60, 49p. 14 refs. AD-243 976.

DESCRIPTORS: *Partial differential equations, Numerical methods and procedures, Computers, Conformal mapping, Applied mathematics, *Functions.

Boundary value problems involve the determination of a function which satisfies a given partial differential equation inside a domain and which assumes prescribed values on the boundary of this domain. The method of the kernel function consists of (1) generating a (complete) set of particular solutions of the partial differential equation, (2) deriving from this system a set of particular solutions which are orthonormal in a suitable sense over a given domain, and (3) determining from the prescribed boundary values a linear combination approximating the desired solution. Computational procedures are discussed for application of a modern automatic computer. The discussion is restricted to the case of Laplace's equation. A domain with a symmetric boundary is considered, and only the case of symmetric boundary values is studied. The method of kernel functions also enable one to find the mapping function which maps a given simply connected domain conformally on to a circle. For the symmetric

domain, an approximation to the mapping function is obtained, and this mapping function is found to map the domain on to a nearly circular region.

PB 152 363 $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
CONTINUOUS TIME STOCHASTIC STORAGE PROCESSES WITH RANDOM LINEAR INPUTS AND OUTPUTS, by Rupert G. Miller, Jr. Technical rept. no. 61 on Contract Nonr-225(52). 23 Sep 60, 36p. 20 refs. AD-243 978.

DESCRIPTORS: *Statistical processes, Probability, Integral transforms.

The behavior of a storage process is determined by the input process and the output mechanism. Models were proposed to analyze a system in discrete or continuous time by imposing varied assumptions on the input and output. The following model is discussed: Let X(t) be the level of the storage process at time t; X(0) = 0. Starting at time 0 the level X(t) increases linearly for a random length of time after which it decreases linearly for a random time. The process continues to alternate between periods of increase and decrease. All time intervals are independently distributed, and the periods of increase and decrease are identically distributed, respectively. Should X(t) return to 0 at some time $t > 0$ it remains at this level until the end of the current period of decrease. The fluctuations between increase and decrease can be interpreted in three ways: (1) periods of input and output actually alternate and never overlap, (2) there is always a constant linear output to the system provided the level is greater than zero but the input process shuts on and off, and (3) the constancy of input and output is reversed, i.e., constant input but alternating output. (Author)

PB 150 746 $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
DISTRIBUTION OF QUADRATIC FORMS: TABLES AND APPLICATIONS, by Herbert Solomon. Technical rept. no. 45 on Contract Nonr-225(53). 5 Sep 60, 53p. 14 refs. AD-242 993.

DESCRIPTORS: *Quality control, Mathematical analysis, Functions, Distribution, Tables, *Interception probabilities, *Statistical distribution.

Three topics are considered: (1) an account of the literature on the distribution of quadratic forms, (2) an account of various applications, and (3) extensive tables for two practical situations. One of the applications is developed for a subject which is called operational quality control. The quality of a product is measured not by physical traits but by its operational performance. Weapons and missiles systems are included. One possible index of quality, in these situations, is the probability of a hit; an index related specifically to the operational characteristics of the products. The tables give the probability of a hit when the parameters of aiming error, location error, and weapon radius are known. A multivariate normal model is assumed for both types of errors. (Author)

PB 152 286 $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
GAME THEORETIC PROOF THAT CHEBYSHEV INEQUALITIES ARE SHARP, by Albert W. Marshall and Ingram Olkin (U. of Minnesota). Technical rept. no. 36 on Contract Nonr-225(21). 20 Sep 60, 16p. 8 refs. AD-243977.

DESCRIPTORS: *Inequalities, *Games theory, Matrix algebra, Statistical distributions.

Consideration is given to showing that Chebyshev inequalities obtained by the standard method are sharp. The proof is based on relating the bound to the solution of a game. An optimum strategy yields a portion of the extremal distribution, and the remainder is obtained as a solution of the relevant moment problem. (Author)

NYO-9494 $3.60

Institute of Mathematical Sciences, New York U., N. Y.
ALTERNATING DIRECTION AND SEMI-EXPLICIT DIFFERENCE METHODS FOR PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS, by Milton Lees. 1 Mar 61, 34p.

ORNL-3132 $0.75

Oak Ridge National Lab., Tenn.
POLFIT II, AN IBM 7090 PROGRAM FOR POLYNOMIAL LEAST SQUARES FITTING, by M. P. Lietzke. Rept. on Contract W-7405-eng-26. 24 Apr 61, 27p.

PB 150 997 $4.60

Sibley School of Mechanical Engineering, Cornell U., Ithaca, N. Y.
THE BETA DISTRIBUTION IN RELIABILITY AND QUALITY CONTROL, by John H. K. Kao. Technical rept. no. 2 on Contract Nonr-401(43). [1960] 44p. 34 refs. AD-243 882.

DESCRIPTORS: *Electronic equipment, Reliability, *Quality control, Life expectancy, Statistical analysis, *Statistical distributions, Statistical tests.

Applications of the beta distribution to a few important statistical problems in the area of quality control and reliability engineering are presented. An outline on the properties of the beta distribution, and its relationship with other well-known statistical distribution are discussed. The applications include designing single sampling plans by attributes for infinitely many choices of consumers' and producers' risks, solving tolerance limit problems for a continuous array of population coverages and confidence coefficients, and finding confidence bands on lifelength distributions for which the data are usually truncated and self-ranked. These applications are made graphically on the beta probability chart of Hartley and Fitch and are illustrated by numerical examples in each case. Hypothesis testing and confidence limits concerning the means or failure rates of the Weibull distribution, based on failure data truncated either by item or by time are also included. (Author)

PB 150 996 $4.60

Sibley School of Mechanical Engineering, Cornell U., Ithaca, N. Y.
SAMPLING PLANS BASED ON THE WEIBULL DISTRIBUTION, by Henry P. Goode and John H. K. Kao. Technical rept. no. 1 on Contract Nonr-401(43). [1960] 44p. 18 refs. AD-243 881.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Electronic equipment, Reliability, *Quality control, Life expectancy, Statistical analysis, *Sampling, *Statistical distributions, Tables.

A proposed set of acceptance-sampling plans for life testing and reliability is presented when the underlying life distribution is of the Weibull form. Inspection of the sample is by attributes with the life test truncated at a preassigned time, t. A set of conversion tables is also provided from which attribute sampling-inspection plans of any desired form may be designed for the Weibull model or from which the operating characteristics of any given plan may be determined. A procedure using these tables for applying the MIL-STD-105B plans to reliability and life-testing applications is included. (Author)

PB 152 011 $3.60

Statistical Lab., U. of California, Berkeley.
A DELIVERY-LAG INVENTORY MODEL WITH AN EMERGENCY PROVISION, by E. W. Barankin. Technical rept. ONR17 on Contract Nonr-222(43). [1960] 39p. 1 ref. AD-243 971.

DESCRIPTORS: *Time lag theory, *Supplies, Production, Statistical analysis.

An inventory model is studied in which there is a fixed lag time of one period for delivery of orders, but in which there is also defined an emergency situation with respect to initial stock at any particular inventory point. When such an emergency situation is obtained an additional order of a specified fixed size is taken with immediate delivery. The indicated emergency character of the model is investigated. This investigation is directed to the case of the single-period problem, so formulated as to present the features which may be expected to arise in the general n-period case. (Author)

PB 152 046 $2.60

Statistical Lab., U. of California, Berkeley.
EXAMINATION OF AN INVENTORY MODEL INCORPORATING PROBABILITIES OF OBSOLESCENCE, by E. W. Barankin, and J. Denny. Technical rept. no. 18 on Contract Nonr-222(43). [1960] 22p. AD-244 744.

DESCRIPTORS: *Economics, *Supplies, Probability, Costs, Distribution, *Operations research.

The numerical study of two models of the inventory problem is presented. The first model is called the ordinary model. The second is called the obsolescence model, and describes an extension of the ordinary model in which the items in the inventory may become obsolescence at any stage. The ordinary model is a special case of the obsolescence model. A comparison is given in one particular case of optimal inventory policies with and without the presence of obsolescence probabilities. The recursion relation is set up for the ordinary model, and the constants and component cost functions are specified numerically. The corresponding work is presented for the obsolescence model, introducing there a specific probability distribution of time of obsolescence. The solutions of the problems of finding the optimal policies and optimum total cost in these two models are presented. (Author)

Computing Devices

BMI-1526 $2.50

Battelle Memorial Inst., Columbus, Ohio.
NUMERICAL RESULTS FOR EGCR MODERATOR-ELEMENT STRESS PROBLEMS, by Lewis E. Hulbert and Robert F. Redmond. Rept. on Contract W-7405-eng-92. 3 July 61, 137p.

PB 154 216 $5.60

Naval Ordnance Lab., Corona, Calif.
SPECIAL BINARY DIGITAL CODE PATTERNS, BY William Horenstein. 15 Nov 60, 57p. 3 refs. NAVWEPS rept. 5992; NOLC rept. 498; AD-250 212.

DESCRIPTORS: *Digital systems, *Coding, Matrix algebra, Vector analysis, *Sequences.

A study is made of two groups of binary codes consisting of odd numbers of digits. Multiplication of any one of these sequences by a decoding matrix, herein defined, results in a row matrix which produces a distinctive type of pulse pattern. The elements of the row matrix - identical with autocorrelation fuctions - consist of plus ones or minus ones and zeros except for the autocorrelation function of zero, where the matrix element is numerically equal to the number of digits in the code. The presentation includes a derivation of the general term of a sequence, synthesis of specific code values, and an analysis of permissible code values. (Author)

PB 155 344 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
A SYSTEM FOR TRANSLATION OF PULSE TYPE MAGNETIC TAPE DATA INTO GRAPHICAL OR DIGITAL INFORMATION, by W. J. Gurney. 22 Sep 59, 37p. 5 refs. Research and development technical rept. USNRDL-TR-379; AD-233 539.

DESCRIPTORS: *Magnetic recording systems, Data processing systems, *Data transmission systems, Dose rate, Determination, Time, *Plotters, *Gamma rays, *Gamma counters, *Digital computers,

The system described in this paper is designed to provide the reduction of recorded pulse type magnetic tape data of gamma radiation and time into digital or graphical form. Commercially available equipment is used throughout and is mounted on three telephone relay racks for ease of operation. The basic operations consist of accumulating radiation data pulses for selected short intervals of recorded field time to

determine the radiation rates, and to determine the total dose through accumulation of these pulses for extended periods. These operations are compared with the integration of recorded field time to achieve either dose rate or total dose histories of the gamma events. The output information is either printed-out on paper tape or converted into analog voltages for semi-automatic plotting. Accuracies are in the order of 90% ± 10% for the analog conversion and errors are within ± 0.5% for the digital printout methods. (Author)

MECHANICS

RM-2686-AEC $2.60

Rand Corp., Santa Monica, Calif.
STATIC DEFORMATION OF A PLASTIC MEDIUM, by Jon Mathews. Rept. on Contract AT(11-1)-135. 18 Jan 61, 26p.

Aerodynamics and Pneumatics

PB 152 243 $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE SPREADING OF SURFACE WAVES, by R. E. Meyer. Technical rept. no. 37 on Contract Nonr-562(07). Sep 60, 27p. 8 refs. Rept. 562(07)/37; AD-243 769.

DESCRIPTORS: *Water waves, *Wave transmission, Wave analysis, Wave characteristics, Mathematical analysis.

The radial spreading of the head of a gravitational wave into water at rest and uniform depth is analysed on the basis of the shallow-water theory. Predictions are derived for the amplitude decay, the wave distortion and the break-down of the shallow-water conditions due to bore-formation (Sections 3,4). Conditions under which the shallow-water theory may be justified are given and the range of validity of the approximation is discussed. The physical interpretation of the mathematical wave structure is also discussed. (Author)

PB 157 269 $1.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
REDUCTION OF DRAG DUE TO LIFT AT SUPERSONIC SPEEDS, by E. W. Graham, P. A. Lagerstrom and others. Final rept. on External and Internal Aerodynamics, Contract AF 33(616)2170. Apr 54, 11p. 6 refs. WADC Technical rept. 54-524, Part 1; AD-63 453.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Drag, Reduction, Lift, Supersonics, *Aerodynamics, Wings.

Several topics relating to the reduction of drag due to lift at supersonic speeds are discussed. The distribution of camber for optimal loading of diamond planform wings and some low drag geometries for rectangular wings are determined. It appears that substantial drag reduction, through the use of spanwise distribution of camber, may be achieved only for low reduced aspect ratios, M^2-1 AR. The distribution of lift throughout volumes of prescribed shape is considered and some optimum distributions found for certain cases. It is shown that optimum spatial distributions of lift are generally not unique. The possibility of using biplanes is explored and it is concluded that for non-interfering biplanes (wings acting as isolated monoplanes) there is an inherent structural advantage which is the result of a scale effect for geometrically similar structures. The present status of means for drag reduction is surveyed and the direction for further study indicated. (Author)

PB 150 881 $1.10

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ROUGHNESS EFFECT AND WAKE INFLUENCE FOR TWO-DIMENSIONAL WIRE ROUGHNESS, by Matthew Stevenson. Technical rept. no. 3 on Effect of Surface Roughness on Turbulent Shear Flows, Contract Nonr-595(07). Sep 60, 10p. 1 ref. Technical note BN-219; AD-243 033.

DESCRIPTORS: Wire, *Wind tunnels, *Turbulent flow, Surface properties, Aerodynamics, Wake.

The roughness effect of wires on two-dimensional turbulent shear flow is measured for seven rough surfaces in a 4" wind tunnel. Results are included for one of these surfaces in a 2" tunnel and good agreement is obtained. Based on a semilogarithmic representation, it is shown that the decrease in roughness effect for increasing density of roughness elements occurs at a critical spacing ratio of the wires. This ratio is related directly to a recirculating region immediately downstream of a wire and is found to be independent of outside flow conditions. (Author) (See also PB 152 173)

PB 155 202 $4.60

Naval Ordnance Test Station, China Lake, Calif.
HUGONIOT CURVE DETERMINED BY SHOCK WAVE DETACHMENT FROM AN INFINITE WEDGE, by William A. Allen and James W. Rogers. 13 Jan 61, 45p. 4 refs. NAVWEPS rept. 7607; NOTS TP 2603; AD-252 577.

DESCRIPTORS: *Shock waves, *Wedges, Compressible flow, Pressure, Tables, Copper.

A method is presented for the determination of the Hugoniot curve of an arbitrary inviscid compressible fluid flowing at supersonic speed past an infinite wedge. A shock wave is attached to the apex of the wedge provided the wedge angle is less than a certain critical value. The shock wave detaches from the wedge if the wedge angle becomes greater than this critical value. If the Hugoniot curve of the fluid is known, the critical wedge angle can be calculated for a given initial fluid flow velocity. The critical angle also can be determined by an experimental method. The theoretical problem is treated of utilizing the discrepancy between theoretical predictions and experimental results to obtain an improved Hugoniot curve of the fluid. A perturbation

method is applied to the case of copper for which both theoretical and experimental information exists. The actual experimental Hugoniot curve for copper does not differ sufficiently from its theoretical value to yield a fair test of the method; therefore, synthetic experimental data is used to solve a typical numerical example. In the example treated a 10% discrepancy between theory and experiment was reduced to about 1% by one application of perturbation theory. (Author)

PB 157 247 $13.50

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
RESEARCH ON THE DESIGN OF HYPERSONIC NOZZLES AND DIFFUSERS AT HIGH STAGNATION TEMPERATURES. PART I. DESIGN AND CONSTRUCTION PROBLEMS OF A HYPERSONIC FACILITY AND PRELIMINARY INVESTIGATIONS OF LIQUID FILM COOLING, by R. Hermann, H. Leitinger, and W. L. Melnik. Rept. on Contract AF 33(616)473. Mar 55, 195p. 39 refs. RAL Research rept. 127; WADC Technical note 55-507; AD-94 456.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Hypersonic nozzles, *Diffusers, Design, Cooling, Test facilities, *Laval nozzles, *Film cooling, *Wind tunnel nozzles.

A hypersonic facility was designed and is being built at the Rosemount Aeronautical Laboratories to conduct research on methods of cooling hypersonic wind tunnel nozzles and diffusers. This facility was designed around an available 12 inch x 12 inch x 12 inch wind tunnel. A theoretical investigation on a Laval nozzle for M - 7 and stagnation temperatures up to 3000°R was made. A preliminary investigation was conducted on surface film cooling of an axisymmetric Laval nozzle for M - 1.92, utilizing the hot gas flow from a jet engine combustion chamber. It was possible to cool the entire Laval nozzle surface with a water film, thus keeping the surface temperature below the local boiling temperature of the water. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 161 759-3 $0.75

Gruman Aircraft Engineering Corp., Bethpage, N. Y.
STUDY OF HYDROFOIL SEACRAFT, VOLUME III. PART VI: AUTOPILOT SYSTEMS FOR STABILITY AND CONTROL. Phase 1 Technical rept. on Contract MA-1730. 3 Oct 58, 28p. 10 refs.

DESCRIPTORS: *Hydrofoil boats, Stability, Control, *Automatic pilots, Design, Flying boat hulls, Marine engineering, Configuration, Hydrodynamics.

Wave contouring is impractical for the vehicle cruise velocities of this study. The design of an autopilot capable of reducing accelerations in a seaway to within comfort limits and providing stability on all axes is feasible and within the present state of the art. Autopilot design can provide automatic sensitivity changing for variations in boat speed and sea state, controlled take-off and landings, coordinated turns and fail-safe features.

PB 155 444 $8.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
FORCES INDUCED BY BREAKING WATER WAVES ON A VERTICAL WALL, by J. J. Leendertse. 9 Mar 61, 84p. 65 refs. Technical rept. R-092; AD-252 980.

DESCRIPTORS: *Water waves, *Hydrodynamics, *Breakwaters, Levees.

Analyses are presented of two-dimensional laboratory measurements of the forces induced by breaking waves on a vertical barrier placed on a plane with a one-to-ten slope. When a wave breaks on the barrier its momentum, calculated by use of the solitary wave theory, is found to be in substantial agreement with the impulse (force times time) on the barrier, measured from the initial impact to the time of momentum reversed (maximum of rise). (Author)

PB 155 128 $6.60

Naval Ordnance Test Station, China Lake, Calif.
APPLICATION OF THIN-AIRFOIL THEORY TO HYDROFOILS WITH CUT-OFF VENTILATED TRAILING EDGE, by Andrew G. Fabula. 13 Sep 60, 61p. 18 refs. NOTS TP 2547; NAVWEPS rept. 7571; AD-252 365.

DESCRIPTORS: *Airfoils, *Hydrodynamics, *Hydrofoils, Fluid flow, *Cavitation, Drag, Wedges, Exhaust gases, *Stabilization systems, Series, Theory, *Torpedoes, Wake, Design, Mathematical analysis, Underwater ordnance.

The linearized thin-airfoil theory for steady, two-dimensional potential flow is applied to slender hydrofoils having a cut-off trailing edge, ventilated by gas exhaust, producing an assumed arbitrary pressure in the cavity. The boundary-value problem separates into two parts: that for the camber line of thin-airfoil theory, and that for the base-ventilated symmetric profile. Of the available cavity-termination models, the closed and open models are used to represent conceivable minimum (zero) and maximum wake-thickness cases. A detailed comparison of linearized and non-linearized solutions for slender wedges, using cavity termination by image wedge, shows the accuracy of linearized theory. By superposition of fundamental step-profile solutions, the arbitrary thickness distribution is obtained. The construction of step-profile solutions for various other classes of flows is indicated. (Author)

PB 155 655 $2.60

Naval Ordnance Test Station, China Lake, Calif.
LINEARIZED THEORY OF VENTED HYDROFOILS, by A. G. Fabula. 7 Mar 61, 23p. 12 refs. NAVWEPS rept. 7637; NOTS TP 2650; AD-254 150.

DESCRIPTORS: *Hydrofoils, Cavitation, Theory, Airfoils, Fluid flow, Hydrodynamics, Lift, Drag, Configuration.

Thin-airfoil theory is applied to two-dimensional vented hydrofoils of arbitrary profile and exhaust location for arbitrary cavity length when cavity termination is behind the trailing edge. For infinite cavity length (cavity pressure equal to freestream pressure), simple integrals for the hydrodynamic coefficients are

obtained. For finite cavity length, the open, partly closed, and closed cavity models are used to represent possible wake effects. With trailing edge venting, thickness and camber effects are separable for infinite and finite aspect ratio. Drag and lift changes due to vented split flaps are considered, and an optimum-L/D type profile with minimum incipient cavitation number is obtained. For side venting, the general solution is obtained using the Boggio integral. To simplify lift and moment calculations, a modified close-cavity model is utilized. (Author)

PB 154 336 $9.60

Naval Ordnance Test Station, China Lake, Calif.
WATER-TUNNEL TEST OF HYDROFOILS WITH FORCED VENTILATION, by Thomas G. Lang, Dorothy Argue Daybell, and Kenneth E. Smith, 10 Nov 59, 116p. 12 refs. NOTS TP-2363; NAVORD rept. 7008; AD-250 220.

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Boundary layer control systems, Bubbles, Ventilation, Cavitation, Lift, Drag, Load distribution, Water tunnels.

The hydrodynamic effects of forcing air through ports in the surface of a hydrofoil are described. The forces acting on the hydrofoil change rapidly with increasing air-flow rate until the air cavity extends past the trailing edge, beyond which point little further change is noticed. Typical results show that when the hydrofoil is fully vented by forcing air through a spanwise row of holes near the leading edge, the lift coefficient may change as much as 0.6 from the fully wetted value at zero angle of attack. The ratio of the lift of a hydrofoil with finite aspect ratio to that of a hydrofoil with infinite aspect ratio is approximately the same in fully vented flow as it is in fully wetted flow. The ratio of the lift-coefficient derivative for a fully vented hydrofoil to that for a fully wetted hydrofoil is approximately equal to the ratio of their cross-sectional wetted perimeters. (Author)

PB 154 337 $6.60

Naval Ordnance Test Station, China Lake, Calif.
WATER-TUNNEL TESTS OF A BASE-VENTED HYDROFOIL HAVING A CAMBERED PARABOLIC CROSS SECTION, by Thomas G. Lang and Dorothy A. Daybell. 10 Oct 60, 66p. 17 refs. NOTS TP 2569; NAVWEPS rept. 7584; AD-250 221.

DESCRIPTORS: *Hydrofoils, *Cavitation, Tests, Model tests, Lift, Drag, Moments, Water tunnels, Aspect ratio.

Results of water-tunnel tests on a base-vented hydrofoil having a cambered parabolic cross section show lift-to-drag ratios of 24 for an infinite aspect ratio and 8.5 for an aspect ratio of 1.44 at the minimum ventilation numbers attained. The drag coefficients measured are in good agreement with linearized cavity theory. The measured lift and moment coefficients are in agreement with wind-tunnel tests of airfoils with streamlined cross sections having the same camber line. The air cavity produced behind the base does not spring forward to the leading edge unless the hydrofoil has stalled or excessive cavitation occurs behind the leading edge. (Author)

METALLURGY

NAA-SR-MEMO-5664 $1.60

Atomics International, Canoga Park, Calif.
A CONTINUOUSLY-OPERATED FURNACE FOR SINTERING REFRACTORIES IN HYDROGEN, by S. Straysberg and T. E. Luebben. 30 Nov 60, 12p.

NAA-SR-MEMO-5856 $1.60

Atomics International, Canoga Park, Calif.
PREPARATION AND TESTING OF HIGH PURITY NOBLE METALS AND ALLOYS, by D. M. Sellman. 8 Nov 60, 10p.

BMI-1528 $1.25

Battelle Memorial Inst., Columbus, Ohio
FABRICATION AND IRRADIATION OF SM-2 CORE MATERIALS, by Stan J. Paprocki, Ronald F. Deckerson and others. Rept. on Contract W-7405-eng-92. 12 July 61, 48p.

BMI-1527 $1.25

Battelle Memorial Inst., Columbus, Ohio.
INCORPORATION OF A BORON BURNABLE POISON AND SPHERICAL UO_2 IN SM-2 STAINLESS-MATRIX FUEL PLATES, by Stan J. Paprocki, Donald L. Keller and others. Rept. on Contract W-7405-eng-92. 6 July 61, 52p.

PB 171 951 $0.75

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
THE PREPARATION OF HIGH PURITY BERYLLIUM AND THE STUDY OF ITS FLOW AND FRACTURE PROPERTIES, by Marvin Herman, G. E. Spangler, and Edward Hein. Final rept. 30 June 59-30 June 60, on Contract NOas 59-6242-c. [1960] 26p. 13 refs. Rept. no. F-A2323.

DESCRIPTORS: *Beryllium, Preparation, Single crystals Fracture (Mechanics), Flotation, Melting.

Several beryllium single crystals were prepared by the floating zone method of zone melting. These crystals, tested in tension, exhibited extensive basal plane glide prior to fracture. These observations represent a significant increase in ductility in comparison to previously reported work. The increased ductility of the zone melted crystals is discussed with respect to the purification attained and also with respect to the role of impurities in the presently proposed fracture mechanisms of beryllium.

GEAP-3605 $0.75

General Electric Co., Pleasanton, Calif.
FABRICATION STUDIES OF CLAD COPPER MATRIX BORIDE DISPERSION CONTROL MATERIALS, by K. C. Antony. Technical rept. on Contract AT(04-3)-189. 30 Dec 60, 25p.

KAPL-2111 $1.00

Knolls Atomic Power Lab., Schenectady, N. Y.
MECHANICAL PROPERTIES OF ZIRCALOY-2 WELD METAL, by S. Beitscher. Rept. on Contract W-31-109-eng-52. 15 Apr 61, 41p.

PB 171 359 $0.50

Massachusetts Inst. of Tech., Cambridge.
RESEARCH IN MECHANICAL PROPERTIES OF SINTERED ALUMINUM POWDERS, by Richard Murphy, Jens Rasmussen and others. Rept. for Sep 52-Sep 60 on Solid State Research and Properties of Matter, Contract AF 33(616)5424. Dec 60, 19p. 16 refs. ARL Technical rept. 60-332; AD-253 213.

DESCRIPTORS: *Aluminum alloys, *Sintered alloys, Powder metallurgy, *Dispersion hardening, Metals, Metallic compounds, Oxides, Cermets, Mechanical properties, Heat resistant alloys, Refractory materials Silicon compounds, Nickel alloys, Copper alloys, Oxidation, Molybdenum compounds, Aluminum compounds, Decomposition, Crystal structure, Thorium compounds Powder alloys.

Dispersion strengthening studies in metal-metal oxide alloy systems, involving the metals aluminum, copper, and nickel have shown that the primary variables controlling strength and stability at high temperatures are oxide particle size, stability of the oxide (freedom from transformations, refractoriness, non-reactivity with the metal matrix), interparticle spacing, and storage of energy via the consolidation process (extrusion, for example). Current studies are concerned first, with methods of achieving the desired particle size and spacing and secondly, with studies of the stability of metal-metal oxide alloys at temperatures approaching the melting point of the matrix metal. The refractoriness of the oxide is shown to be of maximum importance. (Author)

Nonferrous (except light) Metals

PB 171 952 $1.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE FABRICATION OF MOLYBDENUM: AN ANNOTATED BIBLIOGRAPHY, by Maureen A. Pearcy. Dec 60, 51p. 123 refs. Special Bibliography SB-60-41.

DESCRIPTORS: *Molybdenum, Processing, Bibliography.

This bibliography presents a survey of recent literature on the fabrication of molybdenum and molybdenum alloys, particularly those alloys containing 0.5% titanium. The aspects of producibility that were covered include: (1) rolling and forming, (2) welding and brazing, (3) riveting, (4) shearing, and (5) spinning. The majority of literature cited has been published since 1958.

TID-3563 $0.75

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
EXTRUSION OF URANIUM, URANIUM ALLOYS, AND URANIUM COMPACTS, by Theodore F. Davis. June 61, 33p.

NAA-SR-MEMO-5916 $1.60

Atomics International, Canoga Park, Calif.
EFFECT OF HYDROGEN CONTENT ON THE TENSILE PROPERTIES OF ZIRCONIUM, by J. J. Gill. 30 Nov 60, 16p.

NAA-SR-MEMO-5907 $1.10

Atomics International, Canoga Park, Calif.
UNCLASSIFIED LITERATURE SURVEY ON THE RECLAMATION OF ZIRCONIUM AND ZIRCONIUM ALLOY SCRAP, by R. G. Middleton. 11 Nov 60, 17p.

PB 171 947 $2.25

American Machine and Foundry Co., Alexandria, Va.
ULTRA-SHORT-TIME CREEP RUPTURE, by C. W. H. Barnett. Rept. Nov 59-July 60, on Materials Analysis and Evaluation Techniques, Contract AF 33(616)6798. Aug 60, 88p. 1 ref. WADC Technical rept. 59-762. Part 3; AD-251 713.

DESCRIPTORS: *Steel, Sheets, *Creep, Stresses, Rupture, Aerodynamic heating, Simulation, Deformation, Time, Test equipment, Fracture (Mechanics), Heating, *Metals, *Stainless steel, Iron alloys, Heat resistant alloys.

The creep behavior of three structural sheet materials, namely, HM-21, H-11 and 310 stainless steel, was studied to temperatures up to 2,000 F within 200 milliseconds. The recorded results are reported in tabular and graphical form. The testing procedure used in earlier work was modified to load material simultaneously with the heating action, Data were obtained at four creep rates and at three loading rates. From the data obtained, curves of strain vs time, isochronous stress vs strain, and stress vs time were plotted and are presented. (Author) (See also PB 161 983)

NMI-1244 $0.50

Nuclear Metals, Inc., Concord, Mass.
HIGH STRENGTH ZIRCONIUM-BASE ALLOYS, by G. A. Henrikson. Rept on Contract AT(30-1)-1565. 22 Feb 61, 26p.

ORNL-2832 $2.75

Oak Ridge National Lab., Tenn.
CORROSION ASSOCIATED WITH FLUORINATION IN THE OAK RIDGE NATIONAL LABORATORY FLUORIDE VOLATILITY PROCESS, by A. P. Litman and A. E. Goldman. Rept. on Contract W-7405-eng-26. 192p.

ORNL-3063 $0.75

Oak Ridge National Lab., Tenn.
THE CORROSION OF ALUMINUM ALLOYS IN HIGH-VELOCITY WATER AT 170 TO 290°C, by J. L. English, L. Rice, and J. C. Griess. Rept. on Contract W-7405-eng-26. 33p.

ORNL-3151 $0.75

Oak Ridge National Lab., Tenn.
THE CORROSION OF ALUMINUM ALLOYS IN THE OAK RIDGE RESEARCH REACTOR, by P. D. Neumann. Rept. on Contract 7405-eng-26. 25p.

PB 171 946 $1.75

Research Inst., U. of Michigan, Ann Arbor.
FURTHER INVESTIGATIONS OF THE EFFECT OF PRIOR CREEP ON MECHANICAL PROPERTIES OF C110M TITANIUM WITH EMPHASIS ON THE BAUSCHINGER EFFECT, by Jeremy V. Gluck and James W. Freeman. Rept. for 1 Jan 58-31 Mar 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3368. Mar 60, 65p. 24 refs. WADC Technical rept. 59-681; AD-236 917.

DESCRIPTORS: *Titanium alloys, Manganese alloys, Sheets, Creep, Mechanical properties, Temperature, High temperature research, Electron microscopy, Phase transitions.

Studies of the effect of creep at 650 to 800°F on room temperature mechanical properties of C110M sheet showed changes characteristic of the Bauschinger effect. After creep in tension, the tensile yield strength was increased and the compressive yield strength was dedecreased. The effect after 700°F creep was almost as large as that reported after cold-stretching. The extent of the effect was governed by the creep time and the direction of creep with respect to the sheet rolling direction. Studies of variable strain paths revealed no apparent difference between rapid strain and creep strain in inducing a Bauschinger effect. As creep time or temperature increased, recovery reduced the extent of the effect. Unstressed exposure at 700°F removed the effect. The test stock also exhibited a stress-activated structural instability during creep that increased strength and decreased ductility. Strain hardening was a minor factor. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

ISC-1159 $1.25

Ames Lab., Iowa State [U. of Science and Tech.]
EFFECTS OF DEFORMATION ON SUPERCONDUCTING METALS, by Victor Walter Hesterman and C. A. Swenson. Rept. on Contract W-7405-eng-82., Nov 58, 52p.

WAPD-234 $1.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
SUMMARY OF CALCULATIONAL AND EXPERIMENTAL PHYSICS RESULTS FOR SHIPPINGPORT PWR-1 SEED 1, by R. P. Christman and D. H. Jones. Rept. on Contract AT-11-1-GEN-14. Jan 61, 76p.

PB 152 383 $9.10

California U., Berkeley.
NUCLEAR RELAXATION AND DYNAMIC ORIENTATION IN HYDRATED CRYSTALS AT LOW TEMPERATURES, by Olaf S. Leifson. Thesis. Technical rept. no. 4 on Contract Nonr-222(61). 1 Sep 60, 110p. 65 refs. AD-244 746.

DESCRIPTORS: *Nuclear physics, Bibliography, Nuclear magnetic resonance, Paramagnetic resonance, Nuclear resonance, *Crystals, *Single crystals, Lanthanum, Magnesium compounds, Nitrates, Cryogenics, Relaxation time.

The thermal relaxation and dynamic orientation are studied of protons in single crystals of $La_2Mg_3(NO_3)_{12}\cdot 24H_2O$ in which a small fraction of La^{3+} is replaced by paramagnetic Ce^{3+}. An apparatus is described for simultaneously observing nuclear magnetic resonance (16 mc) and paramagnetic resonance (9400 mc) at liquid helium temperatures. The proton relaxation time, T_{1n}, is obtained from the observed exponential decay of the nuclear resonance signals at temperatures in the range $1.6^oK < T < 4.2^oK$ and Ce^{3+} concentrations in the range 0.05 to 5%. For a fixed Ce^{3+} concentration, $T_{1n}^{-1} \propto T^7$. At a fixed temperature T_{1n}^{-1} is roughly proportional to the square of the Ce^{3+} concentration. The Ce^{3+} ion relaxation time, T_{1e}, is also measured in the same crystals by observing the exponential change in the microwave paramagnetic resonance signals following a pulse from a magnetron oscillator. Within experimental error, T_{1e} is found to be independent of Ce^{3+} concentration and $T_{1e}^{-1} \propto T^{14}$ in the range $1.9^oK < T < 2.6^oK$. The relative values of T_{1n} and T_{1e} are best understood in terms of an intermediate case between two idealized models: direct dipolar interaction between Ce^{3+} ions and all protons; and dipolar interaction of a Ce^{3+} ion with only nearest protons, plus spin diffusion among the protons. The protons are dynamically polarized by strongly inducing the (forbidden) microwave transitions which simultaneously flip an electron spin and a proton spin. Many experiments were done at various temperatures and Ce^{3+} concentrations. (Author)

PB 152 406 $1.60

Detroit U., Mich.
CALCULATIONS OF ELECTRON EXCITATION ON FORBIDDEN LINES OCCURRING IN GASEOUS NEBULAE, by Stanley J. Czyzak. Rept. no. 2, 1 Sep 59-31 Aug 60, on Contract Nonr-2820(00). 1 Sep 60, 16p. 2 refs. AD-243 995.

DESCRIPTORS: Wave transmission, Non-linear differential equations, Excitation, Ions, *Programming, Differential equations, Nuclear shell models, *Electrons *Forbidden transitions.

The work during this period involved the calculation of the radial wave functions for various ions. The calculations were performed on an IBM 650 computer using the program developed by Dr. W. W. Piper of the General Electric Research Laboratory. In addition a program is being developed for these calculations of the wave functions on a E-102 Burroughs Computer.

GEAP-3373 $1.75

General Electric Co., Pleasanton, Calif.
THE DETERMINATION OF URANIUM BURNUP IN MWD/TON, by B. F. Rider, J. L. Russell, Jr. and others. 17 Mar 60, 65p.

GEAP-3496 $1.00

General Electric Co., Pleasanton, Calif.
GAMMA ABUNDANCE IN THE RADIOACTIVE DECAY OF KR-85, by B. R. Rider and J. P. Peterson, Jr. 1 Aug 60, 36p.

UCRL-5625 (Rev) $0.50

Lawrence Radiation Lab., U. of California, Livermore
THE NUCLEAR RAMJET PROPULSION SYSTEM, by Theodore C. Merkle. Rept on Contract W-7405-eng-48. 15 May 61, 21p.

UCRL-6441 $0.50

Lawrence Radiation Lab., U. of California, Livermore
OBSERVATIONS ON THE RESPONSE OF A LITHIUM-DRIFTED DETECTOR TO PROTONS, by Jacob Benveniste, Rex Booth, and Arthur C. Mitchell. Rept. on Contract W-7405-eng-48. 18 Apr 61, 10p.

UCRL-6374 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
RESULTS AND POWER GENERATION IMPLICATIONS FROM DRILLING INTO THE KILAUEA IKI LAVA, HAWAII, by Donald E. Rawson and Walter P. Bennett. Rept. on Contract W-7405-eng-48. 24 Mar 61, 32p.

LAMS-2571 $0.50

Los Alamos Scientific Lab., N. Mex.
PRESSURE BALANCE IN THE TOROIDAL ORTHOGONAL PINCH, by B. R. Suydam. Rept. on Contract W-7405-eng-36. May 61, 15p.

NAS-NS-3037 $0.75

Mound Lab., Miamisburg, Ohio
THE RADIOCHEMISTRY OF POLONIUM, by P. E. Figgins. Jan 61, 73p.

ORNL-3124 $1.00

Oak Ridge National Lab., Tenn.
INOR-8-GRAPHITE-FUSED SALT COMPATIBILITY TEST, by R. C. Schulze and W. H. Cook. Rept. on Contract W-7405-eng-26. 7 June 61, 43p.

ORNL-3109 $2.00

Oak Ridge National Lab., Tenn.
AN INVESTIGATION THE THE TRANSFER OF URANYL NITRATE ACROSS THE WATER-TRIBUTYL PHOSPHATE INTERFACE BY THE METHOD OF PHOTOGRAPHIC PHOTOMETRY, by C. V. Chester. Rept. on Contract W-7405-eng-26. 81p.

ORNL-2997 $0.50

Oak Ridge National Lab., Tenn.
NEW LABORATORY DEVELOPMENTS IN THE ZIRCEX PROCESS, by T. A. Gens and R. L. Jolley. Rept. on Contract W-7405-eng-26. 21p.

ORNL-3071 $0.75

Oak Ridge National Lab., Tenn.
RECOVERY OF URANIUM FROM AMINES BY THE HIGH NITRATE-WATER STRIPPING METHOD, by F. G. Seeley and D. J. Crouse. Rept. on Contract W-7405-eng-26. 34p.

ORNL-3039 $1.00

Oak Ridge National Lab., Tenn
REVIEW AND CORRELATION OF IN-PILE ZIRCALOY-2 CORROSION DATA AND A MODEL FOR THE EFFECT OF IRRADIATION, by G. H. Jenks. Rept. on Contract W-7405-eng-26. 42p.

TID-4000 (6th Ed.) $5.00/2 books

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
PUBLIC AVAILABILITY OF REPORTS ABSTRACTED IN NUCLEAR SCIENCE ABSTRACTS. BOOKS I AND II. June 61, 2v.

PB 152 037 $2.60

Palmer Physical Lab., Princeton U., N. J.
STUDIES OF A NEON FILLED SPARK CHAMBER, by James W. Cronin and George Renninger. Technical rept. no. 25 on Cosmic Ray and Elementary Particles Group, Contract Nonr-1858(06). 15 Sep 60, 22p. 5 refs. AD-244 216.

DESCRIPTORS: *Ionization chambers, Neon, Sparks, Photographic analysis, Particle trajectories.

A spark chamber is described which has many uses in combination with counters to form a system with both good time resolution and spatial resolution. The short sensitive time allows the chamber to be operated in regions where the instantaneous flux is as high as 10^6/sec. The resolution in the x y plane is better than 2 mm. The 2-mm spacing of thin plates would produce a device with 2-mm resolution in all three dimensions. (Author)

MATT-Q-13 $0.75

Princeton U., N. J.
PROJECT MATTERHORN, Quarterly rept. 1 Oct -31 Dec 61, on Contract AT(30-1)-1238. 8 Feb 61, 33p.

SCR-420 $2.75

Sandia Corp., Albuquerque, N. Mex.
PROCEEDINGS OF THE UPPER ATMOSPHERE SAMPLING SYMPOSIUM. PART I, by J. D. Shreve, Jr. Held at Sandia Laboratory, Albuquerque, N. Mex. 11-13 Apr 61. July 61, 180p.

PB 171 945 $2.50

Technical Research Group, New York.
FANTASIA AND TRIPROD - SHIELDING CODES FOR THE 1103A UNIVAC, by Herbert Steinberg, Jerome Heitner, and Raphael Aronson. Rept. for Apr 58-Apr 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5187. Sep 60, 111p. 3 refs. WADC Technical rept. 59-443; AD-249 258.

DESCRIPTORS: *Neutrons, Fast neutrons, *Gamma rays, Penetration, Laminates, Shielding, Numerical methods and procedures, *Coding, Mathematical computer data, Programming, *Digital computers.

Two codes were developed for the 1103A Univac. FANTASIA computes neutron transmission through laminated slab shields and slowing down density within the shields by Monte Carlo methods. TRIPROD is a slowing down code suitable for shielding problems. It is based on the General Electric reactor code VALPROD. Both theory and application of FANTASIA and TRIPROD are discussed. Operating instructions are included. (Author)

Elementary Particles

PB 150 758 $2.60

High Energy Physics Lab., Stanford U., Calif.
INELASTIC ELECTRON SCATTERING FROM THE ALPHA PARTICLE, by George R. Burleson. Rept. on Contract N6onr-251(16). 1 Sep 60, 27p. 22 refs. HEPL-201.

DESCRIPTORS: *Electrons, Scattering, *Alpha particles, Proton cross sections, Neutron cross sections, *Inelastic scattering.

The inelastic scattering of electrons from He^4 which corresponds to a disintegration of the nucleus has been studied for incident electron energies of 400 and 500 Mev at laboratory angles from 45° to 135°. The energy spectra of the scattered electrons were measured, and absolute cross sections were found by comparison with elastic scattering from the proton. The curves were corrected for electron radiation.

UCRL-9650 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
HEAVY-ION ELASTIC SCATTERING, by Jonas Alster. Rept. on Contract W-7405-eng-48. 17 Apr 61, 92p.

ORNL-3080 $1.00

Oak Ridge National Lab., Tenn.
AVERAGE ENERGY LOSS PER ION PAIR PRODUCED BY ALPHA PARTICLES IN BINARY GAS MIXTURES, by T. D. Strickler. Rept. on Contract W-7405-eng-26. 43p.

ORNL-2639 $1.50

Oak Ridge National Lab., Tenn.
CALCULATIONS OF NEUTRON AGE IN H_2O AND OTHER MATERIALS, by H. Goldstein, J. G. Sullivan, Jr. and others. Rept. on Contract W-7405-eng-26. 57p.

ORNL-3125 $0.50

Oak Ridge National Lab., Tenn.
PHOTON WAVELENGTH AND ENERGY CONVERSION TABLES, by C. T. Butler and M. T. Robinson. Rept. on Contract W-7405-eng-26. 15p.

Instruments and Installations

UCRL-9651 $0.50

Lawrence Radiation Lab., U. of California, Berkeley
PORTABLE ALPHA-SURVEY INSTRUMENT, by William J. Roach and Robert J. Walker. Rept. on Contract W-7405-eng-48. 17 Apr 61, 10p.

TID-12788 $1.10

National Spectrographic Labs., Inc., Cleveland, Ohio.
BERYLLIUM AIR MONITOR, by R. E. Kupel, J. T. Rozsa and others. Apr 60, 10p.

PB 153 590 $7.60

Naval Radiological Defense Lab., San Francisco, Calif.
METHODS OF FABRICATING ALPHA PARTICLE SCINTILLATION SCREENS, by L. D. Miller and P. N. Petersen. 24 July 59, 74p. 17 refs. Research and development technical rept. USNRDL-TR-349; AD-228 185.

DESCRIPTORS: *Alpha counters, Design, *Scintillation counters, Zinc compounds, Sulfides, Bonding, Plastic coatings, *Alpha particle detectors.

Inadequacies in the alpha detector presently available in radiac instrumentation make it desirable to develop an alpha detection system utilizing a scintillation detector. A compromise had to be made between the ruggedness required and the overall response while considering ease of construction of both the scintillation phosphor and its attached light-tight covering. By making such a compromise, a suitable scintillation screen was developed. Zinc sulfide was used as the scintillation phosphor and was deposited by means of a bonding solution onto a transparent backing plate. To exclude ambient light and to afford some amount of light reflection, this phosphor was covered with a double aluminum coated 1/4 mil Mylar sheet. This Mylar sheet was bonded to the phosphor by means of an edging of one hundred percent solids adhesive. Since the scintillation screen was to be covered by a fine wire mesh, the finished detector (with a moderately rugged light-tight covering) was considered adequate. The overall alpha particle energy attenuation was less than 1 Mev. (Author)

ORNL-3129 $0.50

Oak Ridge National Lab., Tenn.
INLINE DENSIMETER FOR PULSED COLUMN LIQUID DENSITY, PULSE AMPLITUDE, AND PULSE FREQUENCY MEASUREMENTS, by T. S. Mackey. Rept. on Contract W-7405-eng-26. 13p.

CF-59-5-90 $1.10

Oak Ridge National Lab., Tenn.
NUCLEAR AND RADIATION HAZARDS EVALUATION OF SRE FUEL PROCESSING AND STORAGE, by J. C. Suddath. 20 May 59, 3p.

Y-1356 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
AUTOMATION OF LECO CARBON ANALYZERS, by J. J. Henry. Rept. on Contract W-7405-eng-26. 5 June 61, 14p.

Y-1358 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
DEVELOPMENT AND APPLICATION OF THE OXIDOMETER, by J. B. Mankin, Jr. Rept. on Contract W-7405-eng-26. 14 July 61, 21p.

Nuclear Engineering and Power

AGN-TM-381 $1.25

Aerojet-General Nucleonics, San Ramon, Calif.
HECTIC: AN IBM 704 COMPUTER PROGRAM FOR HEAT TRANSFER ANALYSIS OF GAS-COOLED REACTORS, by W. C. Reynolds, D. W. Thompson, and C. R. Fisher. Rept. on Contract AT(10-1)-880. May 61, 60p.

ACNP-6105 $1.25

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
REMOVAL OF ENTRAINED MOISTURE FROM STREAM USING NATURAL SEPARATION AND MECHANICAL DRYERS, by J. F. Wilson and R. J. Grenda. Summary rept. on Contract AT(11-1)589. 15 Apr 61, 51p.

ACNP-6106 $0.50

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
WELDING OF BORON STAINLESS STEEL CONTROL RODS, by Joseph F. Potochnik. Rept. on Contract AT(11-1)-589. 1 Mar 61, 15p.

NAA-SR-MEMO-5701 $2.60

Atomics International, Canoga Park, Calif.
ADVANCED ONCE-THROUGH STREAM GENERATOR FOR SODIUM APPLICATION, by G. R. Terpe. 19 Sep 60, 22p.

NAA-SR-MEMO-6072 $1.10

Atomics International, Canoga Park, Calif.
COST REDUCTION OF SCR SODIUM PUMPS, by R. W. Atz. 25 Jan 61, 10p.

NAA-SR-MEMO-5974 $1.60

Atomics International, Canoga Park, Calif.
DESCRIPTION OF "SHAFT-1" CODE FOR CALCULATION OF RADIATION SHAPE FACTORS IN FINNED SYSTEMS, by R. D. Elliott. 15 Dec 60, 17p.

NAA-SR-MEMO-5834 $1.10

Atomics International, Canoga Park, Calif.
DEVELOPMENT OF AN INEXPENSIVE, REMOTE SAMPLE-TRANSFER DEVICE, by C. D. Bingham and D. Janeves. 3 Nov 60, 5p.

NAA-SR-MEMO-5954 $4.60

Atomics International, Canoga Park, Calif.
FARSE-1A: A MODIFICATION OF FARSE TO INCLUDE ANGULAR DEPENDENCE OF SHIELD LEAKAGE, by K. L. Rooney. 9 Dec 60, 43p.

NAA-SR-MEMO-5953 $1.60

Atomics International, Canoga Park, Calif.
LIQUID SHIELDING EXPERIMENT FOR THE SRE CALANDRIA-CORE CHANGE, by L. E. Anderson. 2 Dec 60, 14p.

NAA-SR-MEMO-4796 $1.60

Atomics International, Canoga Park, Calif.
OPTIMIZATION OF A CONICAL RADIATOR FOR SNAP 2, by R. A. Stone. 28 Dec 59, 11p.

NAA-SR-MEMO-5948 $3.60

Atomics International, Canoga Park, Calif.
SCARF 1 (SCATTERING CONTRIBUTION FROM AN ARRAY OF RADIATOR FINS): A FIRST ORDER APPROXIMATION OF THE SCATTERED FAST NEUTRON CURRENT FOR SNAP REACTOR SYSTEMS, by C. A. Goetz and M. A. Boling. 8 Dec 60, 37p.

NAA-SR-MEMO-5982 $1.60

Atomics International, Canoga Park, Calif.
SHAPE OF A MINIMUM WEIGHT REFLECTOR, by C. M. Podeweltz. 20 Dec 60, 11p.

NAA-SR-MEMO-5961 $1.60

Atomics International, Canoga Park, Calif.
SPACE BACKGROUND TEMPERATURE AND THERMAL RADIATION, by Ernst W. Treuenfels. 6 Dec 60, 10p.

NAA-SR-MEMO-4910 $1.10

Atomics International, Canoga Park, Calif.
STRUCTURAL PROBLEMS ASSOCIATED WITH DESIGN AND ANALYSIS OF THE SNAP II RADIATOR CONDENSER, by H. L. Sujata. 20 Dec 60, 5p.

NAA-SR-MEMO-4754 $8.10

Atomics International, Canoga Park, Calif.
TECHNICAL DESCRIPTION OF A SODIUM-COMPONENT TEST INSTALLATION. 2 May 60, 87p.

BMI-1518 $2.25

Battelle Memorial Inst., Columbus, Ohio
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING MAY, 1961, by Russell W. Dayton and Clyde R. Tipton, Jr. Rept. on Contract W-7405-eng-92. 1 June 61, 99p.

BNL-619 (T-187) $1.25

Brookhaven National Lab., Upton, N. Y.
LIQUID METAL FUEL REACTOR. Four-INCH UTILITY TEST LOOP: DESIGN, CONSTRUCTION, OPERATION, AND EXPERIMENTAL RESULTS, by K. C. Hoffman, R. J. Isler and others. 14 July 60, 50p.

BNL-661 (T-215) $0.50

Brookhaven National Lab., Upton, N. Y.
TABLE OF REACTOR COOLANT PROPERTIES, by Leon Green. 10 Mar 61, 13p.

DP-625 $0.75

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, by R. R. Hood. Progress rept. May 61 on Contract AT(07-2)-1. July 61, 32p.

GEAP-3616 $0.50

General Electric Co., Pleasanton, Calif.
REACTIVITY VS. NUMBER OF NEUTRONS CAPTURED IN CONTROL MATERIALS, by Walter L. Morgan and John L. Russell, Jr. Technical rept. on Contract AT(04-3)-189. 30 Dec 60, 23p.

GEAP-3201-2 Suppl. $0.50

General Electric Co., Pleasanton, Calif.
RELATIVE EFFECTIVENESS OF REACTOR CONTROL MATERIALS, by Walter R. Morgan, John L. Russell, Jr. and William C. Ballowe. Rept. on Contract AT(04-3)-189. 11 Jan 61, 20p.

GEAP-3627 $1.25

General Electric Co., San Jose, Calif.
FUEL CYCLE PROGRAM. A BOILING WATER REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly rept. no. 2, Oct-Dec 60, on Contract AT(04-3)-189. July 61, 49p.

GEAP-3494 $1.50

General Electric Co., San Jose, Calif.
T7 TANKER REACTOR CONTROL SYSTEM, by O. A. Thompson and H. A. Brammer. Summary physics rept. on Contract AT(04-3)-189. 29 July 60, 58p.

HW-69084 $0.50

Hanford Atomic Products Operation, Richland, Wash.
XENON INSTABILITY IN GRAPHITE REACTORS, by G. C. Fullmer. Rept. on Contract AT(45-1)-1350. Feb 61, 16p.

KAPL-2000-13 $2.50

Knolls Atomic Power Lab., Schenectady, N. Y.
REACTOR TECHNOLOGY REPORT NO. 16: METALLURGY. Rept. on Contract W-31-109-eng-52. July 61, 34p.

KAPL-2000-14 $2.00

Knolls Atomic Power Lab., Schenectady, N. Y.
REACTOR TECHNOLOGY REPORT NO. 17: ENGINEERING. Rept. on Contract W-31-109-eng-52. July 61, 82p.

UCRL-9743 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
DEVELOPMENT OF A 100-MA PROTON SOURCE AND LENS SYSTEM FOR THE DEVATRON MARK-II INJECTOR, by Robert W. Allison, Jr., Bruce Cork and others. Rept. on Contract W-7405-eng-48. 12 June 61, 45p.

MURA-618 $0.75

Midwestern U. Research Association, Madison, Wis.
EXPERIMENTAL STRESS ANALYSIS OF A CIRCULAR BUBBLE CHAMBER WINDOW WITH A BEVELED MOUNTING, by Andres Peekna and John W. Mark. Rept. on Contract AT(11-1)-384. 11 May 61, 39p.

MURA-602 $0.50

Midwestern U. Research Association, Madison, Wis.
RELAXATION CALCULATION OF MAGNETIC FIELDS PRODUCED BY DISTRIBUTED CURRENTS IN PRESENCE OF IRON WITH A VARIABLE PERMEABILITY, by S. C. Snowdon and R. S. Christian. Rept. on Contract AT(11-1)-384. 16 Jan 61, 22p.

MURA-611 $0.50

Midwestern U. Research Association, Madison, Wis.
TIME MODES OF A COASTING BEAM IN A SIMPLE PERTURBATION APPROACH, by W. N. Wong. Rept. on Contract AT(11-1)-384. 27 Feb 61, 31p.

PB 154 491 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
ON PREDICTING THE IGNITION SUSCEPTIBILITY OF TYPICAL KINDLING FUELS TO IGNITION BY THE THERMAL RADIATION FROM NUCLEAR DETONATIONS, by S. Martin. 21 Apr 59, 31p. 9 refs. Research and development technical rept. USNRDL-TR-367; AFSWP-1135; AD-231 330.

DESCRIPTORS: *Cellulose, *Fuels, *Thermal radiation, Ignition, Mathematical prediction, Detonation, Nuclear weapons, Absorption, Humidity, Radiation effects.

Ignition threshold energies and ranges of some typical kindling fuels for both kiloton and megaton nuclear weapon air bursts are calculated from previously derived ignition behavior patterns to illustrate the method. The examples demonstrate how the ignition susceptibility of a material can be predicted from the generalized ignition behavior curve with only a knowledge of the optical absorptivity of the material and the readily measurable quantities thickness and weight per unit area. A means of correcting for the effect of the relative humidity of the exposure environment is also given. No direct experimental verification of the prediction curves has been attempted as yet. (Author)

NDA-2147-5 $0.50

Nuclear Development Corp. of America, White Plains, N. Y.
FAST REACTOR SAFETY, by J. Agresta, and F. Beers. Quarterly progress rept. for the period ending 31 Dec 60, on Contract AT(30-1)-2303(XIII). 15 Mar 61, 23p.

NDA-2131-23 $1.50

Nuclear Development Corp. of America, White Plains, N. Y.
INVESTIGATION OF REACTOR TRANSIENTS AND POWER PATTERNS OF A HEAVY WATER-MODERATED, BOILING HEAVY WATER-COOLED REACTOR, by C. Graves, F. E. Beers and others. Rept. on Contract AT(30-1)-2303(IX). 21 Mar 61, 59p.

ORNL-3068 $1.00

Oak Ridge National Lab., Tenn.
AQUEOUS PROCESSES FOR DISSOLUTION OF URANIUM-MOLYBDENUM ALLOY REACTOR FUEL ELEMENTS, by L. M. Ferris. Rept. on Contract W-7405-eng-26. 39p.

ORNL-2935 $2.50

Oak Ridge National Lab., Tenn.
FISSION-PRODUCT RELEASE FROM UO_2, by W. B. Cottrell, H. N. Culver and others. Rept. on Contract W-7405-eng-26. 13 Sep 60, 141p.

ORNL-3079 $1.50

Oak Ridge National Lab., Tenn.
HFIR HEAT-TRANSFER STUDIES OF TURBULENT WATER FLOW IN THIN RECTANGULAR CHANNELS, by W. R. Gambill and R. D. Bundy. Rept. on Contract W-7405-eng-26. 75p.

ORNL-3122 $2.75

Oak Ridge National Lab., Tenn.
MOLTEN-SALT REACTOR PROGRAM. Progress rept. 1 Aug 60-28 Feb 61, on Contract W-7405-eng-26. 161p.

ORNL-3123 $0.50

Oak Ridge National Lab., Tenn.
PLASMA STABILITY ANALYSIS EMPLOYING EQUILIBRIUM CONSTANTS OF MOTION, by T. K. Fowler. Rept. on Contract W-7405-eng-26. 19p.

ORNL-3158 $0.50

Oak Ridge National Lab., Tenn.
RESIDUAL RADIATION OF THE LRL 184-INCH CYCLOTRON, by R. W. Boom, K. S. Toth, and A. Zucker. Rept. on Contract W-7405-eng-26. 16p.

ORNL-3145 $0.75

Oak Ridge National Lab., Tenn.
A STUDY OF FISSION PRODUCT TRANSPORT MECHANISMS IN HIGH TEMPERATURE GAS-COOLED REACTOR FUEL ELEMENTS, by A. R. Saunders. Rept. on Contract W-7405-eng-26. 34p.

IDO-16677 $0.50

Phillips Petroleum Co., Idaho Falls.
SPERT PROJECT, ed. by F. Schroeder. Quarterly technical rept. July-Sep 60, on Contract AT(10-1)-205. 10 May 61, 27p.

IDO-16687 $0.50

Phillips Petroleum Co., Idaho Falls.
SPERT PROJECT, ed. by F. Schroeder. Quarterly technical rept. Oct-Dec 60, on Contract AT(10-1)-205. 1 June 1961, 23p.

SRIA-36 $2.50

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
CONTAINMENT OF FRAGMENTS FROM A RUNAWAY REACTOR, by G. B. Huber and N. R. Zabel. Rept. on Contract AT(04-3)-115. 31 Oct 60, 117p. SRI proj. no. GU-2164.

RWD-RL-190 $2.75

Ramo-Wooldridge Div., Calif.
KINETIC STUDIES OF HETEROGENEOUS WATER REACTORS C52-1U10. Annual summary rept. 1960 on Contract AT(04-3)-165. 30 Dec 60, 132p.

DP-583 $0.50

Savannah River Lab., Aiken, S. C.
FRICTION FACTORS FOR FLOW OF WATER IN AN ANNULUS WITH ONE ROUGHENED WALL, by W. S. Durant. Rept. on Contract AT(07-2)-1. June 61, 21p.

YAEC-183 $1.50

Westinghouse Electric Corp., Pittsburgh, Pa.
A STUDY OF FUEL DEPLETION AND CONTROL ROD PROGRAMMING IN THE YANKEE REACTOR, by J. D. McGaugh. Rept. on Contract AT(30-3)-222. Nov 60, 60p.

Nuclear Reactions

ORO-406 $8.10

Atomic Energy Commision, Oak Ridge, Tenn.
IONIZATION AND CHARGE TRANSFER CROSS SECTIONS. PHASES I AND II: H^+ IONS INCIDENT ON He, Ne, Ar, H_2, N_2, O_2, and CO TARGETS, by E. W. McDaniel, J. W. Hooper and others. Technical status rept. no. 7 on Contract AT-(40-1)-2591. 1 June 61, 81p.

NAA-SR-MEMO-5889 $1.60

Atomics International, Canoga Park, Calif.
FINITE DIFFERENCE APPROXIMATIONS TO THE NEUTRON DIFFUSION EQUATION, by H. P. Flatt. 12 Dec 60, 17p.

NAA-SR-MEMO-6078 $3.60

Atomics International, Canoga Park, Calif.
HAMBONE: A MONTE CARLO CODE TO EVALUATE NEUTRON SCATTERING FROM CYLINDRICAL FUEL RODS, by W. J. Roberts and K. L. Rooney. 27 Jan 61, 38p.

LA-2525 $3.50

Los Alamos Scientific Lab., N. Mex.
THORIUM CROSS SECTIONS AND THEIR TEMPERATURE DEPENDENCE, by Joseph J. Devaney, Leona O. Bordwell, and Ralph E. Anderson. Rept. on Contract W-7405-eng-36. Apr 61, 251p.

PB 150 258 $2.60

Nevis Cyclotron Lab., Columbia U., Irvington-on-Hudson, N. Y.
DYNAMICS OF INTERNALLY CONVERTED ELECTRON-POSITRON PAIRS, by N. P. Samios. Rept. on Contracts AT(30-1)-1932 and N6-ori-110, T. O. 1. [1960] 29p. 17 refs. R-273; CU-198; Nevis-91; AD-241 850.

DESCRIPTORS: *Nuclear reactions, *Internal conversion, Positrons, Electrons, Dynamics.

The reactions studied were $\pi^- + P \rightarrow n + \pi^0_{\hookrightarrow \gamma + e^+ + e^-}$ and $\pi^- + P \rightarrow n + e^+ + e^-$. From a sample of ~15,000 internally converted electron-positron pairs, 7,000 were measured, of which 4200 were used in the detailed analysis. The differential distribution in y, the energy partition, and x^2, the virtual mass of the photon, agree with the theoretical quantum electrodynamic calculations. A measure of the form factor for the $\pi^0 \rightarrow 2\gamma$ reaction gave a value $\Gamma(x/\mu) = 1 - (0.24 \pm 0.16)\, x^2/\mu^2$. It was further demonstrated that the number of events necessary to determine the contribution of the longitudinally polarized virtual γ-rays in the second reaction is of the order of 50 times that in the present experiment. (Author)

Waste Disposal

BNL-602 (T-175) $1.75

Brookhaven National Lab., Upton, N. Y.
A REVIEW OF THE UTILIZATION OF FISSION FRAGMENT ENERGY FOR THE FIXATION OF NITROGEN, by Meyer Steinberg, J. R. Powell, and Leon Green. 17 Jan 61, 72p.

LAMS-2566 $0.50

Los Alamos Scientific Lab., N. Mex.
LOW EXPOSURE METHOD FOR DISPOSING OF HIGH ACTIVITY WASTES, by J. W. Schulte, F. J. Fitzgibbon, and D. S. Shaffer. Rept. on Contract W-7405-eng-36. 15 June 61, 12p.

ORNL-3036 $0.75

Oak Ridge National Lab., Tenn.
A PHENOLIC RESIN ION EXCHANGE PROCESS FOR DECONTAMINATING LOW-RADIOACTIVITY-LEVEL PROCESS WATER WASTES, by J. T. Roberts and R. R. Holcomb. Rept. on Contract W-7405-eng-26. 5 June 61, 28p.

PHYSICS

ISC-1176 $1.25

Ames Lab., Iowa State [U. of Science and Tech.]
HALL COEFFICIENT AND RESISTIVITY OF A Mg_2Si SINGLE CRYSTAL FROM 4° K TO 300° K, by Donald Richard Zrudsky and G. C. Danielson. Rept. on Contract W-7405-eng-82. May 59, 49p.

IS-285 $0.50

Ames Lab., Iowa State U. of Science and Tech.
ON THE DIFFERENT CRYSTALLOGRAPHIC PHASES OF SOLID HELIUM, by Newton Bernardes. Rept. on Contract W-7405-eng-82. 3 Apr 61, 10p.

ANL-6346 $3.00

Argonne National Lab., Ill.
PROCEEDINGS OF THE SYMPOSIUM ON PHYSICS AND NONDESTRUCTIVE TESTING. Held at Argonne National Laboratory, Ill., 4-5 Oct 60. 208p.

NAA-SR-MEMO-6015 $1.60

Atomic International, Canoga Park, Calif.
LOW FREQUENCY CONDUCTIVITY OF OMRE COOLANT SAMPLES, by R. L. Carter. 5 Jan 61, 11p.

GEAP-3574 $0.50

General Electric Co., San Jose, Calif.
ANALYTICAL METHODS FOR CONSUMERS RESEARCH AND DEVELOPMENT PHYSICS, by M. L. Couchman and C. L. Miller. 1 Nov 60, 15p.

UCRL-6450 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
EVALUATION OF SOME INTEGRALS ARISING IN THE THEORY OF IONIZED GASES, by John G. Trulio and Stephen G. Brush. Rept. on Contract W-7405-eng-48. 17 May 61, 12p.

PB 171 936 $2.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
PHYSICS OF ULTRASONICS AND HYPERSONICS IN SOLIDS: AN ANNOTATED BIBLIOGRAPHY, by A. A. Beltran. Sep 60, 103p. 193 refs. Special Research Bibliography SRB-60-9; AD-252 351.

DESCRIPTORS: *Solids, *Ultrasonics, *Hypersonics, *Bibliography, Physics, Physical properties.

Ultrasonic and hypersonic radiation ranging from several megacycles to above 1000 megacycles; its generation, detection and propagation in solids is covered in this annotated bibliography. Piezoelectric sources of ultrasonic radiation; optical, mechanical and electrical methods of detection; measurement equipment, methods and results; and propagation, attenuation and absorption are included.

LAMS-2562 $2.00

Los Alamos Scientific Lab., N. Mex.
BIBLIOGRAPHY ON SELF-DIFFUSION OF PURE METALS IN THE SOLID STATE 1950-1960, by Robert L. Andelin and Lois E. Godfrey. Rept. on Contract W-7405-eng-36. May 61, 94p.

ORO-407 $14.00

Miami U., Coral Gables, Fla.
PRINCIPLES OF PLASMA DYNAMICS, by Behram Kursunoglu. Rept. on Contract AT-(40-1)-2761. 15 May 61, 207p.

PB 161 612 $1.00

National Bureau of Standards, Boulder, Colo.
DATA REDUCTION INSTRUMENTATION FOR RADIO PROPAGATION RESEARCH, by Walter E. Johnson. July 61, 38p. 6 refs. Technical note 111.

DESCRIPTORS: *Radio waves, Propagation, Analysis, *Data processing systems, Data, Reduction

An approach is given to the overall problem of data reduction instrumentation for tropospheric radio propagation research. The need for early coordinated planning between those responsible for the data taking, data analysis, and data reporting is emphasized. A multi-channel, magnetic tape system is described as a successful solution to the data taking problem. Three special purpose computers are described as solutions to the data analysis problem: a spectrum analyzer, a distribution analysis system, and a correlation computer. Three computation aids are described as aids for the reduction of data not recorded on magnetic tape: the refractive index computer, the amplitude distribution analyzer and chart scaler, and the punch tape data translation system. (Author)

PB 154 914 $3.60

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS. Quarterly rept for Oct-Dec 60. 15 Feb 61, 35p. 25 refs. NAVWEPS rept. 7162, pt. 1; NOLC rept. 539, pt. 1; AD-251 910.

DESCRIPTORS: *Ferromagnetic materials, *High temperature research, Resonance, Polymers, *Magneto-optic rotation, Water, Thin films, *Optical analysis, Reflectometers,

Contents:
FERROMAGNETIC RESONANCES, by C. A. Roberts.
HIGH TEMPERATURE POLYMER PROGRAM, by C. M. Douglas, D. L. Herring and others.
MAGNETIZATION REVERSAL STUDIES, by R. L. Conger.
OPTICAL PROPERTIES OF WATER, by B. McSwain and J. Bernstein.

PB 152 346 $1.60

Willow Run Labs., U. of Michigan, Ann Arbor.
SCATTERING OF SOUND BY ISOTROPIC TURBULENCE OF LARGE REYNOLDS NUMBER, by G. W. Ford and W. C. Meecham. Rept. on Contract Nonr-1224(32) and Proj. Michigan, Contract DA 36-039-sc-78801. Sep 60, 16p. 7 refs. Rept. 2944-1-T [and 2900-43-T].

DESCRIPTORS: *Sound, Scattering, *Fluids, Turbulence, *Reynolds number, Hydrodynamics.

This report proposes a predictive theory for determining how sound energy spreads over frequency as a result of the scattering process. Such a theory, by providing information on the structure of turbulence, may improve the determination of radar resolution. Furthermore, such information is useful in assessing sound attenuation due to scattering.

Electronics

PB 152 265 $1.60

California U., La Jolla.
ON THE MOMENTUM DISTRIBUTION OF AN INTERACTING ELECTRON GAS, by E. Daniel and S. H. Vosko. Technical rept. no. 2 on Contract Nonr-2216(11). [1960] 15p. 5 refs. AD-245 035.

DESCRIPTORS: *Electrons, Gases, Density, Numerical analysis, Metals, Energy.

The momentum distribution of an interacting electron gas at zero temperature is studied in the high density region. Numerical computations are made for the graphs corresponding to the excitation of pairs, which are known to be equivalent to the random phase approximation of Bohm and Pines. Exchange graphs are discussed. The numerical results, extrapolated to actual electronic densities in metals, show that a large discontinuity in the momentum distribution still remains at the Fermi level. (Author)

ORNL-3081 $0.75

Oak Ridge National Lab., Tenn.
EQUILIBRIUM ELECTRON DISTRIBUTIONS IN ELASTICALLY SCATTERING GASES, by R. H. Ritchie and G. W. Whitesides. Rept. on Contract W-7405-eng-26. 26p.

PB 152 592 $10.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT NO. 41 FOR PERIOD ENDING 29 FEBRUARY 1956, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. [Rept. on Contract DA 36-039-sc-42607]. 15 Apr 56, 139p. 73 refs. AD-99 230.

This report released for sale to the public 16 Aug 61.

DESCRIPTORS: *Electronics, *Microwaves, Microwave spectroscopy, Gas discharges, *Communications theory, Circuits, Nuclear magnetic resonance, Hyperfine structure, Beams, Multipath transmission, Data, Processing, Transmission, Noise (Radio), Thermodynamics, Biophysics, Electrical networks, Synthesis, Machine translation.

Physical electronics; Microwave gaseous discharges; Low temperature physics; Microwave spectroscopy; Nuclear magnetic resonance and hyperfine structure; Microwave electronics; Atomic beams; Multipath transmission; Statistical communication theory; Processing and transmission of information; Transistor circuits; Noise in electron devices; Irreversible thermodynamics Mechanical translation; Communications biophysics; Neurophysiology; Nonlinear circuits; Network synthesis; Microwave theory.

Molecular Physics and Spectroscopy

NAA-SR-MEMO-6010 $1.60

Atomics International, Canoga Park, Calif.
U^{235} ENRICHMENT DETERMINATION BY GAMMA SPECTROMETRY, by T. B. Crockett. 5 Jan 61, 10p.

PB 150 965 $1.60

Colorado U., Boulder.
PRECISE MEASUREMENT OF THE MICROWAVE ABSORPTION FREQUENCIES OF THE OXYGEN MOLECULE, by Robert W. Zimmerer and Masataka Mizushima. Technical rept. no. 4 on Contract Nonr-1147(05). Sep 60, 16p. 11 refs. AD-243 352.

DESCRIPTORS: *Oxygen, Microwaves, Absorption, Measurement, *Microwave spectroscopy, *Electron transitions, Nuclear spins, Klystrons, *Light, Velocity.

Ten microwave absorption frequencies of the O molecule in the 60-kmc region were measured with an accuracy of about 10 kc. Thirty-kmc microwave power, generated by an EMI klystron, was multiplied by a diode to 60 kmc. The klystron frequency was phase-locked to a harmonic of a quartz crystal oscillator at 2.5 mc which transferred the frequency stability of the oscillator to the 30-kmc klystron. Zeeman modulation of 70 c was used with a 25 ft absorption cell. A special wave form was used to eliminate the distortion caused by the conducting walls of the absorption cell as well as a fixed bias to eliminate the residual stray magnetic field. Careful testing was conducted to establish the independence of the center frequency from the magnitude of the Zeeman field and its modulation frequency. Detection of the signal was by means of a bolometer and a recorder. The line width parameter was measured to resolve a discrepancy between old data.

PB 150 743 $1.10

Wayne State U., Detroit, Mich.
MACROMOLECULAR SHAPE FROM LIGHT SCATTERING IN STREAMING SOLUTIONS, by Wilfried Heller, Eiichi Wada, and Louise A. Papazian. Technical rept. no. 44 on Contract [Nonr]-736(00). 1 Sep 60, 7p. 4 refs. AD-243 089.

DESCRIPTORS: *Molecular structure, Molecules, Light, Scattering, Solutions, *Refractive index, Measurement, Determination.

A new method for determining anisometric particle and macromolecular dimensions from light scattering was tested successfully by means of a concentric cylinder apparatus using a suspension of tobacco mosaic virus. Parameters are: (1) the observed change in light scattering, ΔP, relative to that at rest, P_o, as a function of the rate of shear, G, for observations at 90° with respect to the unpolarized incident beam and at two angles, ω, with respect to the reverse direction of the streamlines; and (2) the variation of $\Delta P/P_o$ with azimuthal angle, ω, for the two values of G. The limits of $\Delta P/P_o$ here represent the extreme range of experimental uncertainty. All results are easily explained by the increase in particle orientation with G and the simultaneous change in the preferential angle of observation. In order to translate such effects of nonspherical particles into actual particle dimensions, two theories, one for spheroids and another for thin rods are employed. The curve derived from the latter for rods 300 mu long and 15 mu in diameter resulted in differences from the results derived electromicroscopically. The differences may be accounted for by the modest, but pronounced heterodispersion. No effect was observed for a polystyrene latex of diameter 271 mu. This method is now being tested for application to deformation studies in streaming solutions of flexible polymer molecules.

Optics

PB 171 539 $0.50

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
LONG FOCAL LENGTH LENSES AND THE PROBLEM OF RESOLUTION, by Radames K. H. Gebel. Mar 60, 17p. WADC Technical note 59-188.

DESCRIPTORS: *Telescope lenses, Lenses.

A method is presented in this report for modifying the effective focal length of an existing telescope. In most cases the physical length of the telescope is not increased very much by the modification; however, the effective focal length may be increased many times its original value. For this modification it is possible to use various available lenses or those easily secured from available stockpiles. A theoretical analysis is presented and basic calculations developed which permit achieving proper matching of the resolution of the telescope and the resolution of the sensor by using one or more additional lens systems between the telescope and the sensor. These principles are further illustrated in two accompanying diagrams. (Author)

PB 156 459 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
OPTICAL TRANSMISSION MEASUREMENTS OF AN ANTI-FLASH SYSTEM, by R. J. Jenkins and E. R. Schleiger. 13 July 60, 38p. 6 refs. TR-445; AD-245 680.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Telescopes, *Telescopic gun sights, Thermal radiation, Nuclear explosions, Radiation effects, Optical filters, Tests, Transmission, Carbon arc lamps, *Optical instruments.

Evaluation tests were performed on a Battery Commander's M-65 telescope as modified by the addition of a Kerr cell shutter system to provide observer protection from the intense flash of nuclear weapons. The evaluation tests consisted of the measurement of the transmission through the telescope of the radiant energy from a carbon arc source and determination of the spectral transmission in the range 0.3 to 3.0 microns. A group of filters (polarizing, reflecting and absorption types) were tested for transmission characteristics and ability to resist intense thermal radiation from a carbon arc source. (Author)

OTS SB-466 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
INFRARED, PART I: GENERAL RESEARCH, EQUIPMENT AND MATERIALS. May 61, 13p. 218 refs. OTS Selective Bibliography SB-466.

DESCRIPTORS: *Infrared equipment, *Infrared optical materials, *Infrared detectors, *Infrared photography, Bibliography.

Lists PB reports, translations and AEC reports added to the OTS collection during the period 1950 to June 1961. The 218 references are arranged in the following categories: general research; infrared detectors; infrared photography; infrared optical equipment and materials; infrared equipment, general; Government-owned patents on infrared. (SB-467 INFRARED Part II: covers information on infrared spectroscopy, infrared spectrum analysis, and on infrared spectrometers.)

PB 171 944 $1.00

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
VAPOR PHASE GROWTH OF SILICON, by H. J. Beatty, R. Glang and others. Quarterly progress rept. no. 1, 1 Aug-31 Oct 60, on Contract DA 36-039-sc-87395, continuation of Contract DA 36-039-sc-84547. [1960] 36p. 5 refs. Rept. no. 5; AD-253 566.

DESCRIPTORS: Single crystals, Growth, Thin films, *Silicon, *Semiconductors, Deposits, Vapors, *Transistors, Hydrogen, Reduction, Iodides.

Some process parameters pertaining to the closed tube silicon-di-iodide deposition reaction are discussed. The limitations of the silicon-iodine disproportionating reaction are pointed out and show the advantages of an open-tube type of configuration. Experiments on the hydrogen reduction of silicon tetraiodide show the feasibility of epitaxial silicon growth by this reaction. Transistor structures, with two of the N- and P- type regions consisting of vapor grown silicon were fabricated. (Author)

PB 171 943 $0.75

IBM Command Control Center, Federal Systems, Div. Kingston, N. Y.
VAPOR PHASE GROWTH OF SILICON, by H. J. Beatty, R. Glang and others. Quarterly progress rept. no. 2, 1 Nov 60-31 Jan 61, on Contract DA 36-039-sc-87395, continuation of Contract DA 36-039-sc-84547. [1961] 29p. 3 refs. Rept. no. 6; AD-253 567.

DESCRIPTORS: *Silicon, Single crystals, Growth, Deposits, *Semiconductors, *Silanes, Chlorides, Silicon compounds, Resistance, Impurities, Thin films, Reduction, Hydrogen, *Transistors.

An apparatus was built to deposit silicon by means of the hydrogen reduction of trichlorosilane. A series of experiments conducted with this new apparatus has shown that single crystal films can be grown with a perfection better than those obtained using the SiI2 disproportionation reaction in the closed tube process. Deposition rates are faster than those obtained with the di-iodide process. The interface problem, formerly almost insurmountable, was eliminated completely, and the surfaces of the deposits are smoother. Refinement of process control is needed to eliminate surface defects completely, and more care has to be exercised to prevent uncontrolled pickup of impurities from various sources. A study was made concerning the controlled introduction of impurities to grow films with specified resistivities. (Author) (See also PB 171 944)

PB 150 984 $3.60

Institute of Tech., U. of Minnesota, Minneapolis.
THE THEORY OF DIFFUSION IN SEMICONDUCTORS, by R. A. Swalin. Technical rept. no. 3 on Contract Nonr-710(27). 1 Sep 60, 36p. 39 refs. AD-243 429.

DESCRIPTORS: *Semiconductors, *Diffusion, Theory, Germanium, Silicon, Diamonds, Oxygen, Hydrogen, Helium, Lithium.

The mechanism of solute and self diffusion in elemental semiconductors are considered, with emphasis on: (1) self-diffusion in Ge, Si, and diamond; (2) diffusion of Group III and Group V elements in Ge and Si; (3) diffusion of O in Si; and (4) diffusion of H, He and Li in Ge and Si. Theoretical calculations were made of D_0 and Q on the basis of a vacancy mechanism. In order to facilitate computation, the potential between atoms is represented in the form of the Morse function. In this fashion kinetic properties were calculated from static equilibrium properties. In the problem of the diffusion of Group III-V elements in Ge and Si, the detailed nature of the coulombic interaction between impurities and vacant lattice sites at elevated temperatures was examined. It was concluded that these interactions are responsible for the rapid diffusion of Group V elements compared with Group III elements in Ge and the reverse situation in Si. With regard to the diffusion of O in Si, it was postulated that O diffuses interstitially but that it need be associated with a vacancy in order to satisfy bonding requirements. Examination of the diamond lattice indicated that the strain energy contribution to the activation energy is negligible in view of the open nature of the lattice. Calculations were made of the activation energies on the assumption that the energy barrier is due to coulombic repulsion between the imperfectly screened nuclei of interstitial and solvent atoms.

PB 150 172 $1.60

Northwestern U. Technological Inst., Evanston, Ill.
THE ELECTRICAL CONDUCTIVITY OF NEAR-STOICHIOMETRIC α-Nb_2O_5, E. H. Greener, D. H. Whitmore, and M. E. Fine. Technical rept. no. 1 on Contract Nonr-1228(16). 19p. 15 refs. AD-242 401.

DESCRIPTORS: *Niobium compounds, Oxides, Single crystals, Electrical conductance, Semiconductors.

The electrical conductivity of α-Nb_2O_5 monocrystalline and sintered specimens, measured under a constant ambient oxygen pressure and over the temperature range 300° to 900° C, exhibits an exponential temperature dependence with an activation energy of 1.65 ev. The isothermal conductivity, σ, of near-stoichiometric α-Nb_2O_5 is related to the ambient oxygen partial pressure, PO_2, by the power law expression $\sigma = \text{Const.}\ PO_2^{-0.24 \pm 0.01}$. Both sets of observations may be rationalized on the basis that slightly-reduced α-Nb_2O_5 becomes a metal-excess, n-type semiconducting oxide containing oxygen vacancies capable of trapping electrons. A detailed analysis of the relation between conductivity and ambient oxygen pressure has indicated that the conductivity dependency may be ascribed to a mechanism whereby defect levels (due to oxygen ion vacancies with either one or two trapped electrons) are created and electrons are thermally excited from these levels into the conduction band. (Author)

PB 155 027 $3.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 9, 15 Aug-15 Nov 59, on Contract DA 36-039-sc-74895. [1959] 40p. 17 refs. AD-231 407.

DESCRIPTORS: Resonance absorption, Radiofrequency, *Paramagnetic resonance, *Paramagnetic crystals, Measurement, Spectrographic analysis, Microwave amplifiers.

Methods for removing the gain-bandwidth restriction, which are especially applicable to paramagnetic amplifiers, are discussed. The design problems of a paramagnetic frequency standard that is now being modeled are presented. The static saturation characteristics, and the subsequent time-dependent recovery in paramagnetic systems are outlined. The properties of the resonant transitions between levels that nearly cross over each other in a paramagnetic system (S=3/2) are analyzed. A description of a laboratory standard for calibrating electron paramagnetic-resonance apparatus is given. (Author) (See also PB 147 970)

PB 155 028 $3.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 10, 15 Nov 59-15 Feb 60, on Contract DA 36-039-sc-74895. [1960] 39p. 25 refs. AD-237 152.

DESCRIPTORS: Resonance absorption, Radiofrequency, *Paramagnetic resonance, *Paramagnetic crystals, Measurement, Spectrographic analysis, *Microwave amplifiers,

A discussion of gain-bandwidth limitations in circuits having negative R, L, and C, which occur in paramagnetic amplifiers, is presented. Theoretical limitations on gain-bandwidth relationships are described and realization of these limits is discussed. Measurements of the concentration-linewidth relationship for ruby are given and their implications discussed. The optimum disposition of lossy samples in an electron magnetic-resonance apparatus is discussed. (Author) (See also PB 155 027)

PB 155 029 $2.60

Research Lab. of Electronics., Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 11, 15 Feb-15 May 60, on Contract DA 36-039-sc-74895. [1960] 24p. 8 refs. AD-241 852.

DESCRIPTORS: *Paramagnetic resonance, Chromium, Ruby, *Magnetic fields, Coils, Ions, Measurement, *Microwave amplifiers, Spectrographic analysis, Paramagnetic crystals, Radiofrequency, Resonance absorption.

A discussion of the Cr^{3+} concentration-linewidth measurements for ruby is given, and their implication of a possible relationship between the actual ion concentration and the effective concentration is indicated. Magnetic field calculations carried out for a rectangular Helmholtz-coil arrangement are presented. (Author) (See also PB 155 028)

PB 171 953 $1.75

Armour Research Foundation, Chicago, Ill.
EXPERIMENTAL STUDIES TO DETERMINE THE CHEMICAL SPECIES PREVALENT IN THE PLASMA OF AN AIR ARC AND THE BOUNDARY LAYERS ADJACENT TO ABLATING MATERIALS, by R. Carrigan, E. Raisen, and K. Schmude. Rept. for 1 June 59-31 May 60, on Experimental Techniques for Materials Research, Contract AF 33(616)6686. Oct 60, 64p. 27 refs. WADD Technical rept. 60-359.

DESCRIPTORS: *Ablation, *Plasma jets, Boundary layer, Mass spectrometers, Heat transfer, Aerodynamic heating

The objective of this work is to obtain an increased understanding of plasma jet processes as related to the use of the plasma jet arc to test ablating systems. Plasma jets were constructed and operated as sources for optical and time-of-flight mass spectrometry. Optical spectroscopic methods were used to identify chemical species and state of excitation when inert gas or air was used as the plasma arc working medium. Time-of-flight mass spectrometry was not developed to the point where species could be identified. (Author)

NAA-SR-MEMO-5934 $1.10

Atomics International, Canoga Park, Calif.
HIGH TEMPERATURE X-RAY DIFFRACTION INVESTIGATION OF BeO, by K. T. Miller. 2 Dec 60, 3p

BMI-1531 $0.50

Battelle Memorial Inst., Columbus, Ohio
THERMODYNAMICS OF BORON LOSS IN UO_2-STAINLESS STEEL DISPERSION FUEL ELEMENTS, by James J. Ward, Carl A. Alexander and others. Rept on Contract W-7405-eng-92. 18 July 61, 23p.

UCRL-6455-T $0.50

Lawrence Radiation Lab., U. of California, Livermore
THERMODYNAMIC DATA FOR WATER, by John C. Howard. Rept. on Contract W-7405-eng-48. 18 Apr 61, 16p.

PB 157 277 $4.60

Stanford U., Calif.
THE BASIC HEAT TRANSFER AND FLOW FRICTION CHARACTERISTICS OF PLAIN-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Technical rept. no. 5 on Contract N6onr-251, T.O. 6. 15 May 49, 47p. 8 refs. ATI-56 813.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Heat exchangers, Surfaces, *Fins, *Heat transfer, Friction, Thermodynamics.

This report contains the results of basic heat transfer and flow friction tests of four variations of plain plate-fin heat exchanger surfaces. The heat transfer and flow friction characteristics, respectively, are given in both tabular and graphical form using the conventional dimensionless correlations employing the Stanton, Prandtl, Fanning friction factor, and Reynolds numbers in the form, (h/Gc_p). $Pr^{2/3}$ and f versus $(4r_hG/\mu_f)$. The characteristics are also given in graphical form as a function of a Reynolds number based on fin flow-length, $(\ell G/\mu_f)$. The heat transfer coefficient-friction power characteristics of the surfaces, evaluated at specified standard gas properties (air at 1 atm. and 500° F) are also presented graphically and in tabular form.

PB 157 276 $4.60

Stanford U., Calif.
THE HEAT TRANSFER AND FLOW FRICTION PERFORMANCE OF THREE COMPACT PLATE-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Technical rept. no. 7 on Contract N6onr-251, T.O. 6. 1 Dec 49, 43p. 11 refs. ATI-66 575.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Heat exchangers, Surfaces, Tests, *Fins, *Heat transfer, Friction, Thermodynamics.

Basic heat transfer and flow friction characteristics of three compact high performance plate-fin-type heat transfer surfaces are presented. One surface is of strip or serrated fin construction while the other two have ruffled fins. Both strip and ruffled fins exhibit similar heat transfer characteristics, which suggest a similarity of the convective heat transfer mechanisms in the flow boundary layer. The performance of strip fin surfaces is dependent to a certain extent upon the character of the leading and trailing edges of the fins.

PB 157 275 $3.60

Stanford U., Calif.
AN INVESTIGATION OF THE EFFECT OF FIN SPACING ON THE PERFORMANCE OF LOUVERED PLATE-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Technical rept. no. 3 on Contract N6onr-251, T.O. 6. 15 Dec 48, 39p. 5 refs. ATI-56 763.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Heat exchangers, Surfaces, Tests, *Fins, *Heat transfer, Friction, Thermodynamics.

This report contains the results of basic heat transfer and flow friction tests of three fin-spacing variations of louvered plate-fin type high rating heat exchanger surfaces. All three surfaces have the same plate spacing and louver length. The heat transfer and flow friction characteristics, respectively, are given in both tabular and graphical form using the dimensionless correlations $(h/Gc_p)Pr^{2/3}$ and f versus Re_f. Also included are the heat transfer - friction power characteristics evaluated at certain standard gas properties, h_{std} versus E_{std}. The test results indicate that the heat transfer characteristics can be well correlated by use of a Reynolds' number based on flow passage hydraulic radius, but that the friction factors correlates on such a basis only at $Re < 1000$. A discussion of the reasons for this behavior is included. (Author)

PB 171 931 $1.50

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
CALCULATION OF THE SECOND VIRIAL COEFFICIENT FOR THE MORSE POTENTIAL, by D. D. Konowalow, M. H. Taylor and J. O. Hirschfelder, Rept. on Research on the Theory of Flame Propagation Contract AF 33(616)7174. Dec 60, 58p. 14 refs. ARL Technical note 60-157; AD-221 924.

DESCRIPTORS: *Molecules, Energy, *Gases, Thermodynamics, Equation of state, *Flame propagation.

Tables are given for the classical second virial coefficient and its first two temperature derivatives for gases obeying a Morse potential, $\phi(r)=(x^2 - 2x)$, where $x = \exp -(c/\sigma)(r-r_m)$. The results are tabulated over the temperature range $0.3 \leq kT/\epsilon \leq 400$ for seven values of the parameter c in the range $3 \leq c \leq 10$ and should be accurate to one part in ten million. For any other value of c or for values of kT/ϵ not given in the tables, algorithms are presented for rapid computation of the second viral coefficient (or its derivatives). Integrals involving the attractive portion of the potential are represented by a power series in $(kT/\epsilon)^{-1}$, while integrals involving the repulsive portion of the potential are represented by expansions in Chebyshev polynomials. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 154 784 $4.60

Assistant Secretary of Defense (Supply and Logistics), Washington, D. C.
BETTER MANAGEMENT THROUGH LOGISTICS RESEARCH. Edition no. 4. Feb 61, 46p. 95 refs. AD-251 341.

DESCRIPTORS: *Logistics, *Management engineering, *Air force logistics, *Naval logistics, Economics, *Costs, Military research, Air force research, Games theory, Mathematical analysis, Supplies, Scheduling, Maintenance, *Operations research, Naval research.

Although the studies described in this pamphlet represent only a small percentage of the total number of logistics studies sponsored by activities within the Department of Defense, they are considered to be the most important current projects in terms of research effort and problem significance. The content of this pamphlet was divided into Army, Navy, and Air Force sections without regard to further classification by logistics function. Complex logistics problems demand an organized and inquiring research approach. Although this approach alone is not a substitute for good management, it does provide logistics managers with a better understanding of the interrelating elements of their problems and it makes available to them a sounder basis for their decisions. This summary of logistics research projects is one step toward fostering this understanding. (Author)

PB 150 555 $7.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. I. ADMINISTRATION AND ORGANIZATION FOR DATA COLLECTION, by J. E. Hamilton. Rept. on Logistics Research Project, Contract Nonr-761(05). 8 Sep 60, 78p. 17 refs. Serial T-117/60; AD-242 853.

DESCRIPTORS: *Research program administration, *Naval research, Task forces, Naval logistics, Logistics, Data, Collecting methods.

The principle lessons in administration and organization which this program netted are: (1) strong naval sponsorship and support are mandatory; (2) direct contact between the collector and the sources is essential. This contact should be personal to the greatest extent possible complemented by correspondence; (3) firm understanding must be established as to exactly what data (documents) are to be provided; (4) all data received should be inspected at once and correspondence to clear up any discrepancies initiated without delay; (5) a schedule of expected receipts of data should be maintained and inquiry should be made in any case of apparent delinquency; (6) key personnel should be retained throughout the life of a program; (7) no results of magnitude should be expected for at least six years after a program is conceived; and (8) persons engaged in the program should be dedicated to it. (Author)

SOCIAL SCIENCES

PB 150 425 $1.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
A NOTE ON THE POSSIBILITY OF A DIVIDED STRUCTURE FILE PERMITTING ARBITRARY SUBSTRUCTURE SEARCHES, by John O'Connor. Rept. on Contract [Nonr] 551(35). [1960] 14p. 5 refs. AD-243 354.

DESCRIPTORS: *Data storage systems, Data processing systems, Design, Programming, Molecular structure, Stereochemistry, Determination, *Documentation, Automation.

Given a file of structures $S_1, \ldots S_N$ and an arbitrary question structure Q, to find which S_i's include Q as a substructure. Organic molecule structures provide an example of this problem. The problem can be solved by comparing Q with all NS_i's. However, the question arises as to whether the following approach can be used: divide the file, with duplicate storage entries for S_i's, so that (1) the search for any Q need examine at most K file structures, with K some fraction of N; (2) the average number of storage entries per S_i is $\leq D$; and (3) at most Z headings have to be compared with Q to determine which part of the file to search. A method for forming such a divided file is described abstractly. Attention is confined to those Q's which are included in at least one and no more than M file structures. Among these Q's are some, $B_1, \ldots B_t$, which form an included basis for the rest, in that any other Q includes at least one B_k. The generation of the included basis from the file structures is abstractly described. (Author)

PB 152 252 $2.60

Northwestern Technological Inst., Evanston, Ill.
SYSTEMS EVALUATION AND REPRICING THEOREMS, by A. Charnes and W. W. Cooper (Carnegie Inst. of Tech.). ONR Research memo. no. 31 on Temporal Planning and Management Decision under Risk and

Uncertainty, Contract Nonr-1228(10) and Planning and Control of Industrial Operations, Contract Nonr-760(01). Sep 60, 26p. 9 refs. AD-243 807.

DESCRIPTORS: *Scheduling, Mathematical analysis, Functional analysis, Transportation.

The problem of sensitivity analysis in linear programming is focused on systems evaluation and repricing theorems. Systems evaluation refers to the sequence of functional values, or changes in functional values, that are associated with optimal programming adjustments that correspond to each possible variation in the data. A repricing theorem is secured whenever an equivalent linear programming problem for effecting the desired analysis can be constructed. Variations in $c' = (c_1, \ldots, c_n)$ and $b' = (b_1, \ldots, b_m)$ are considered in a problem of the form max $z = c'x$ subject to $Ax \leq b$, $x \geq 0$. The problem is assumed to be regular throughout the analysis so that issues concerning solvability, boundedness, etc. can be waived. The constructed repricing theorems are focused on transportation-type models because of their simplicity and general interest in a wide variety of applications.

PB 157 281 $6.60

Stanford U., Calif.
ECONOMIC CRITERIA FOR THE ALLOCATION OF THE PUBLIC BUDGET: BENEFITS-COST MEASUREMENTS AS A CASE STUDY, by Julius Margolis. Technical rept. no. 28 on Contract N6onr-25133. 5 Dec 55, 62p. 47 refs. AD-79 283.

This report released for sale to the public 15 Aug 61.

DESCRIPTORS: *Federal budgets, *Economics, Theory, Costs.

A D INDEX

AD No.	Div.
260 000	9
260 001	26
260 002	7
260 003	12
260 007	25
260 008	30
260 009	25
260 010	25
260 011	12
260 012	12
260 013	9
260 014	8
260 015	8
260 016	30
260 017	9
260 020	2
260 021	22
260 022	30
260 024	25
260 025	8
260 029	25
260 030	25
260 031	14
260 032	9
260 033	1
260 034	27
260 040	10
260 041	8
260 042	27
260 044	7
260 045	8
260 046	16
260 047	4
260 048	5
260 049	25
260 050	24
260 051	6
260 052	22
260 053	8
260 054	8
260 058	12
260 059	30
260 060	26
260 061	25
260 063	18
260 064	8
260 065	14
260 066	7
260 067	10
260 068	7
260 069	30
260 071	14
260 072	26
260 073	30
260 075	25
260 076	11
260 077	12
260 078	11
260 079	17
260 081	26
260 082	9
260 083	25
260 085	27
260 086	18
260 087	17
260 088	25
260 089	25
260 090	25
260 092	8
260 093	5
260 095	15
260 097	8
260 098	8
260 099	26
260 100	1
260 101	28
260 104	28
260 111	8
260 112	8
260 113	25
260 114	8
260 116	8
260 117	30
260 118	30
260 119	25
260 120	4
260 122	16
260 123	14
260 131	28
260 132	18
260 136	8
260 137	22
260 139	30
260 141	12
260 144	27
260 147	30
260 153	7
260 156	7
260 161	4
260 162	8
260 164	25
260 165	28
260 166	28
260 171	19
260 172	19
260 175	6
260 176	25
260 177	2
260 178	12
260 179	9
260 180	2
260 181	9
260 182	2
260 183	25
260 184	27
260 185	14
260 194	14
260 195	30
260 196	12
260 199	25
260 200	17
260 201	10
260 202	18
260 203	15
260 204	15
260 205	25
260 208	25
260 209	14
260 212	16
260 213	16
260 214	17
260 215	30
260 216	3
260 218	30
260 219	2
260 221	30
260 222	30
260 223	24
260 224	30
260 226	17
260 227	1
260 228	1
260 229	29
260 230	8
260 231	16
260 232	8
260 235	31
260 237	2
260 239	30
260 240	30
260 241	30
260 243	16
260 244	8
260 245	8
260 246	8
260 247	8
260 248	25
260 249	8
260 250	31
260 251	25
260 252	14
260 253	14
260 254	30
260 255	25
260 256	15
260 263	6
260 264	22
260 268	4
260 271	2
260 272	8
260 274	8
260 275	5
260 276	5
260 277	5
260 279	25
260 280	2
260 281	8
260 282	25
260 283	5
260 285	5
260 286	5
260 287	16
260 288	5
260 289	14
260 290	30
260 291	16
260 292	8
260 293	5
260 294	5
260 295	2
260 296	8
260 302	9
260 303	20
260 304	25
260 305	8
260 308	25
260 311	5
260 312	28
260 313	17
260 315	23
260 316	23
260 317	23
260 318	23
260 319	23
260 320	23
260 321	23
260 322	11
260 323	25
260 324	12
260 325	15
260 329	15
260 330	25
260 331	25
260 332	8
260 333	10
260 334	25
260 335	25
260 336	25
260 337	15
260 338	15
260 344	25
260 345	4
260 346	8
260 347	7
260 348	30
260 350	8
260 351	8
260 352	30
260 353	7
260 354	1
260 356	8
260 357	7
260 358	7
260 359	7
260 360	8
260 361	8
260 362	7
260 363	8
260 364	8
260 365	8
260 366	25
260 367	8
260 368	7
260 369	30
260 370	30
260 371	30
260 372	25
260 373	14
260 374	8
260 375	8
260 379	4
260 382	8
260 383	6
260 384	13
260 385	13
260 386	16
260 387	16
260 388	25
260 389	26
260 390	6
260 391	9
260 392	30
260 393	10
260 394	22
260 395	5
260 397	14
260 400	26
260 401	4
260 402	10
260 403	8
260 404	10
260 405	22
260 406	25
260 407	10
260 408	2
260 413	8
260 418	16
260 421	17
260 422	14
260 423	26
260 424	7
260 425	17
260 426	6
260 427	16
260 428	9
260 429	8
260 431	2
260 434	8
260 436	31
260 440	6
260 441	16
260 445	28
260 451	15
260 452	26
260 457	5
260 458	8
260 459	8
260 460	2
260 461	31
260 462	15
260 463	30
260 465	26
260 470	26
260 471	30
260 472	2
260 473	17
260 474	17
260 475	17
260 476	25
260 477	2
260 478	25
260 479	14
260 480	2
260 481	26
260 483	26
260 484	14

AD No.	Div.
260 489	17
260 490	17
260 491	17
260 495	8
260 497	4
260 500	8
260 501	30
260 504	9
260 505	28
260 508	8
260 509	9
260 511	6
260 515	7
260 519	25
260 520	25
260 521	26
260 522	25
260 523	25
260 524	14
260 525	8
260 528	28
260 529	30
260 530	1
260 531	27
260 532	8
260 534	25
260 535	27
260 536	14
260 537	8
260 538	20
260 540	9
260 541	9
260 542	12
260 543	27
260 544	8
260 545	10
260 546	1
260 547	17
260 549	16
260 551	23
260 552	15
260 554	2
260 555	8
260 556	28
260 557	28
260 558	28
260 560	15
260 561	14
260 564	25
260 565	16
260 568	15
260 569	4
260 571	2

AD No.	Div.
260 572	8
260 573	15
260 574	7
260 575	14
260 576	25
260 577	25
260 578	2
260 579	25
260 580	17
260 581	14
260 582	16
260 586	16
260 587	18
260 588	4
260 589	25
260 590	27
260 591	25
260 594	17
260 595	20
260 597	17
260 598	15
260 599	8
260 600	8
260 601	2
260 604	13
260 605	13
260 606	15
260 607	32
260 608	15
260 609	15
260 610	15
260 611	30
260 627	8
260 628	26
260 629	7
260 632	17
260 633	30
260 634	9
260 635	9
260 636	9
260 637	12
260 638	1
260 639	1
260 640	9
260 641	9
260 642	9
260 643	30
260 649	20
260 657	26
260 658	8
260 659	4
260 660	7

AD No.	Div.
260 662	5
260 663	1
260 664	25
260 665	14
260 666	32
260 669	25
260 670	16
260 671	30
260 672	15
260 674	28
260 675	28
260 678	1
260 679	1
260 681	1
260 682	1
260 686	26
260 691	27
260 692	30
260 693	17
260 696	8
260 697	8
260 698	8
260 699	8
260 700	7
260 701	22
260 702	8
260 703	8
260 704	15
260 705	20
260 706	1
260 707	6
260 708	15
260 709	15
260 710	15
260 711	15
260 712	15
260 713	15
260 714	15
260 715	15
260 716	15
260 717	15
260 718	9
260 719	9
260 721	25
260 722	8
260 723	2
260 725	10
260 726	10
260 727	2
260 728	27
260 729	15
260 730	15

AD No.	Div.
260 731	30
260 732	15
260 733	32
260 735	15
260 737	8
260 738	1
260 739	7
260 740	3
260 741	8
260 746	25
260 750	8
260 751	15
260 753	15
260 755	2
260 758	12
260 759	1
260 760	27
260 761	9
260 762	9
260 763	20
260 764	9
260 765	25
260 766	12
260 767	25
260 768	8
260 769	25
260 770	30
260 771	8
260 772	22
260 773	17
260 775	25
260 776	8
260 778	9
260 779	25
260 780	25
260 781	8
260 782	30
260 783	8
260 784	11
260 786	7
260 787	16
260 788	16
260 789	16
260 790	8
260 791	25
260 792	8
260 793	15
260 794	17
260 795	29
260 796	8
260 797	25
260 798	1
260 799	25

NUMBER INDEX

Number	Page
ACNP-6105	S-33
ACNP-6106	S-33
AD-1298	S-23
AD-9368	S-8
AD-15 392	S-15
AD-33 239	S-9
AD-64 453	S-26
AD-72 032	S-14
AD-74 787	S-9
AD-79 283	S-43
AD-81 562	S-10
AD-94 456	S-27
AD-94 606	S-1
AD-99 230	S-38
AD-118 379	S-1
AD-204 900	S-16
AD-217 643	S-14
AD-211 924	S-42
AD-228 185	S-32
AD-230 230	S-16
AD 231 115	S-8
AD-231 330	S-35
AD-231 407	S-40
AD-231 472	S-14
AD-231 667	S-17
AD-232 741	S-18
AD-232 806	S-5
AD-233 026	S-20
AD-233 539	S-25
AD-234 109	S-21
AD-236 917	S-30
AD-237 152	S-40
AD-241 850	S-36
AD 241 852	S-40
AD-242 401	S-40
AD-242 541	S 3
AD-242 800	S-3
AD-242 853	S-42
AD-242 993	S 24
AD-243 033	S-26
AD-243 089	S-38
AD-243 126	S-14
AD-243 205	S-22
AD-243 294(PB 171 931)	S-42
AD-243 352	S-38
AD-243 354	S-42
AD-243 364	S-20
AD-243 429	S-39
AD-243 518	S-7
AD-243 531	S-4
AD-243 582	S-7
AD-243 759	S-17
AD-243 769	S-26
AD-243 807	S-42
AD-243 879	S-15
AD-243 881	S-25
AD-243 882	S-24
AD-243 971	S-25
AD-243 976	S-23
AD-243 977	S-24
AD-243 978	S-24
AD-243 995	S-30
AD-244 216	S-31
AD-244 599	S-8
AD-244 744	S-25
AD-244 746	S-30
AD-244 747	S-2
AD-245 035	S-37
AD-245 162	S-14
AD-245 352	S-2
AD-245 353	S-17
AD 245 521	S-6
AD-245 680	S-39
AD-245 982	S-4
AD-246 035	S-15
AD-247 724	S-4
AD-248 371	S-6
AD-248 642	S-8
AD-249 258	S-32
AD-249 729	S-18
AD-249 765	S-22
AD-249 853	S-16
AD-250 127	S-3
AD-250 212	S-25
AD-250 220	S-28
AD-250 221	S-28
AD 250 222	S-18
AD-250 624	S-6
AD-250 626	S-5
AD-250 643	S-13
AD-250 646	S-9
AD-250 700	S 23
AD-251 309	S-13
AD-251 341	S-42
AD-251 713	S-29
AD-251 910	S-37
AD-251 947	S-2
AD-252 065	S-23
AD-252 351	S-37
AD-252 365	S-27
AD-252 577	S-26
AD-252 697	S-15
AD-252 855	S-19
AD-252 861	S-13
AD-252 862	S-13
AD-252 885	S-2
AD-252 886	S-3
AD 252 980	S-27
AD-253 058	S-14
AD-253 213	S-29
AD-253 430	S-12
AD-253 431	S-12
AD-253 566	S-39
AD-253 567	S-39
AD-254 150	S-27
AD-254 344	S-13
AD-254 377	S-16
AD-254 731	S-20
AD-254 921	S-11
AD-255 896	S-8
AD-255 915	S-20
AD-257 357 repriced	S-19
AD-257 358 repriced	S-19
AD-257 823 repriced	S-22
AD-257 874	S-10
AD-258 135 repriced	S-17
AD-258 138 repriced	S-18
AD-258 191	S-4
AD-258 262 repriced	S-12
AD-258 753 repriced	S-19
AD-259 551	S-21
AD-260 450	S-21
AERDL-1668-TR	S-11
AEWES TM-3-414, R-4	S-12
AEWES TR-3-455, R-1	S-11
AFCRL-76	S-16
AFCRL-318	S-18
AFCRL-351	S-22
AFCRL TN-60-1166	S-17
AFOSR-762	S-7
AGN-TM-381	S-33
AIL-2390-4	S-14
AMC-TR-59-7-767	S-20
AN/APS-31	S-14
ANL-6320	S-6
ANL-6340	S-22
ANL-6346	S-36
ANL-6364	S-4
ARL-TN-60-157	S-42
ARL-TR-60-332	S-29
ASRDL-2195	S-8
ATI-35 622	S-2
ATI-56 763	S-41
ATI-56 813	S-41
ATI-66 575	S-41
BMI-1518	S-34
BMI-1526	S-25
BMI-1527	S-28
BMI-1528	S-28
BMI-1531	S-41
BN-219	S-26
BNL-602(T-175)	S-36
BNL-619(T-187)	S-34
BNL-661(T-215)	S-34
BuMed MR005.13-8003.1, R-7	S-3
BuMed MR005.15-0002.15, R-2	S-3
BuMed MR005.15-2002.1, R-23	S-2
CCL-106	S-21
CF-59-5-90	S-33
CIC-122	S-14
CRDL SP-4-27	S-20
CU-45-60	S-3
CU-46-60-Nonr-266(33)	S-3
CU-198	S-36
DAC SM-18319, summary	S-26
DASA-752	S-10
DASA-1135	S-35
DP-583	S-36
DP-625	S-34
DSR-7476	S-7
EOS-390, v. 1	S-19
EOS-390, v. 6	S-19
ERL-112	S-14
ERL-113	S-15
FAA Task 59-203.8	S-10
FI F-A2323	S-28
GEAP-3201-2 Suppl.	S-34
GEAP-3373	S-31
GEAP-3494	S-34
GEAP-3496	S-31
GEAP-3574	S-37
GEAP-3605	S-28
GEAP-3616	S-34
GEAP-3627	S-34
GWU-T-107/60	S-20
GWU-T-117/60	S-42
HAC DX-O-1	S-9
HASL-109	S-19
HEPL-201	S-32
HW-68435	S-19
HW-69064	S-34
HW-69500	S-4
IDO-10036	S-19
IDO-16677	S-35
IDO-16687	S-35
IER-60-307	S-14
IER-60-309	S-15
IS-285	S-36
ISC-1159	S-30
ISC-1176	S-36
KAPL-2000-13	S-34
KAPL-2000-14	S-34
KAPL-2111	S-29
KY-373	S-8
LA-2525	S-36
LAMS-2562	S-37
LAMS-2566	S-36
LAMS-2571	S-31
Lear ADR-516	S-9
Lock SB-60-41	S-29
Lock SB-61-2	S-19
Lock SRB-60-9	S-37
MATT-Q-13	S-31
MLNYNS-4860-G-2, FR	S-21
MRP(Republic)-58-71	S-20
MURA-602	S-34
MURA-611	S-34
MURA-618	S-34
NAA-SR-6331	S-22
NAA-SR-6382	S-6
NAA-SR-MEMO-3818	S-6
NAA-SR-MEMO-4615	S-18
NAA-SR-MEMO-4754	S-34
NAA-SR-MEMO-4796	S-33
NAA-SR-MEMO-4910	S-34
NAA-SR-MEMO-5664	S-28
NAA-SR-MEMO-5686	S-6
NAA-SR-MEMO-5701	S-33
NAA-SR-MEMO-5785	S-6
NAA-SR-MEMO-5834	S-33
NAA-SR-MEMO-5856	S-28
NAA-SR-MEMO-5889	S-36
NAA-SR-MEMO-5907	S-29
NAA-SR-MEMO-5916	S-29
NAA-SR-MEMO-5934	S-41
NAA-SR-MEMO-5948	S-33
NAA-SR-MEMO-5953	S-33
NAA-SR-MEMO-5954	S-33
NAA-SR-MEMO-5961	S-33
NAA-SR-MEMO-5974	S-33
NAA-SR-MEMO-5982	S-33
NAA-SR-MEMO-5989	S-22
NAA-SR-MEMO-5998	S-22
NAA-SR-MEMO-6010	S-38
NAA-SR-MEMO-6015	S-37
NAA-SR-MEMO-6041	S-22
NAA-SR-MEMO-6072	S-33
NAA-SR-MEMO-6078	S-36
NADC-EL-6078	S-14
NADC-MA-6038	S-3
NADC-MA-6042	S-2
NADC-MA-L6101	S-2
NADC-MA-6102	S-3
NAS-NS-3037	S-31
NAS-NS-3102	S-5
NAS-NS-3103	S-5
NAVTRADEVCEN 57-2-5	S-2
NAVWEPS-5992	S-25
NAVWEPS-7008	S-28
NAVWEPS-7162, pt. 1	S-37
NAVWEPS-7571	S-27
NAVWEPS-7574	S-18
NAVWEPS-7580	S-16
NAVWEPS-7584	S-28
NAVWEPS-7592	S-18
NAVWEPS-7607	S-26
NAVWEPS-7627	S-20
NAVWEPS-7637	S-27
NBS TN-107	S-16
NBS TN-111	S-37
NCEL N-359	S-6
NCEL N-395	S-13
NCEL N-361	S-5
NCEL N-385	S-13
NCEL N-391	S-9
NCEL N-400	S-13
NCEL N-403	S-23
NCEL R-080	S-13
NCEL R-092	S-27
NCEL R-117	S-23
NCEL R-123	S-12
NCEL R-128	S-13
NCEL R-133	S-12
NCEL-R-151	S-19
Nevis-91	S-36
Nevis R-273	S-36
NMI-1244	S-29
NDA-2131-23	S-35
NDA-2147-5	S-35
NOLC-498	S-25
NOLC-539, pt. 1	S-37
NOTS TP-2363	S-28
NOTS TP-2547	S-27
NOTS TP-2550	S-18
NOTS TP-2561	S-16
NOTS TP-2569	S-28
NOTS TP-2581	S-18
NOTS TP-2603	S-26
NOTS TP-2632	S-20
NOTS TP-2650	S-27
NYO-8779	S-7
NYO-9494	S-24
ORNL-2639	S-32
ORNL-2832	S-29
ORNL-2935	S-35
ORNL-2992	S-31
ORNL-3036	S-36
ORNL-3039	S-31
ORNL-3063	S-29
ORNL-3068	S-35
ORNL-3071	S-31
ORNL-3079	S-35
ORNL-3080	S-32
ORNL-3081	S-38
ORNL-3109	S-31
ORNL-3122	S-35
ORNL-3123	S-35
ORNL-3124	S-31
ORNL-3125	S-32
ORNL-3129	S-33
ORNL-3132	S-24
ORNL-3145	S-35
ORNL-3151	S-30
ORNL-3158	S-35
ORO-406	S-36
ORO-407	S-37
OSURF-768-8	S-14
OSW RDPR-50	S-10
OSW RDPR-51	S-10
OSW RDPR-52, pt. 1-2	S-11
OSW Spec-198	S-11
OSW Spec-198, app. A	S-11
OTS CTR-333, suppl.	S-1
OTS SB-436	S-1
OTS SB-466	S-39
OTS SB-468	S-1
PA DB-TR:6-60	S-18
PB 150 172	S-40
PB 150 258	S-36
PB 150 425	S-42
PB 150 555	S-42
PB 150 622	S-3
PB 150 623	S-3
PB 150 640	S-1
PB 150 743	S-38
PB 150 746	S-24
PB 150 758	S-32

Number	Page
PB 150 832	S-14
PB 150 881	S-26
PB 150 965	S-38
PB 150 984	S-39
PB 150 986	S-2
PB 150 990	S-20
PB 150 996	S-25
PB 150 997	S-24
PB 152 010(PB 171 939)	S-22
PB 152 011	S-25
PB 152 037	S-31
PB 152 046	S-25
PB 152 072	S-7
PB 152 086	S-4
PB 152 116	S-7
PB 152 120	S-4
PB 152 184	S-17
PB 152 243	S-26
PB 152 248	S-2
PB 152 251	S-17
PB 152 252	S-42
PB 152 265	S-37
PB 152 286	S-24
PB 152 346	S-37
PB 152 362	S-23
PB 152 363	S-24
PB 152 383	S-30
PB 152 395(PB 152 346)	S-37
PB 152 406	S-30
PB 152 408	S-6
PB 152 412	S-15
PB 152 558	S-8
PB 153 113(PB 171 931)	S-42
PB 153 590	S-32
PB 152 592	S-38
PB 152 709	S-16
PB 153 788	S-14
PB 154 209	S-5
PB 154 216	S-25
PB 154 219	S-16
PB 154 220	S-18
PB 154 336	S-28
PB 154 337	S-28
PB 154 338	S-18
PB 154 342	S-3
PB 154 393	S-14
PB 154 489(PB 171 946)	S-30
PB 154 491	S-35
PB 154 498	S-6
PB 154 499	S-8
PB 154 506	S-23
PB 154 590	S-12
PB 154 591	S-11
PB 154 690	S-6
PB 154 692	S-5
PB 154 698	S-13
PB 154 699	S-9
PB 154 784	S-42
PB 154 787	S-13
PB 154 914	S-37
PB 155 027	S-40
PB 155 028	S-40
PB 155 029	S-40
PB 155 063	S-23
PB 155 114	S-13
PB 155 128	S-27
PB 155 188	S-14
PB 155 189	S-2
PB 155 202	S-26
PB 155 243	S-8
PB 155 301	S-3
PB 155 302	S-2
PB 155 313	S-13
PB 155 344	S-25
PB 155 444	S-27
PB 155 445	S-12
PB 155 551	S-10
PB 156 599(AD-258 135)	S-17
PB 156 600(AD-258 138)	S-18
PB 156 601(AD-257 823)	S-22
PB 156 624(AD-258 262)	S-12
PB 156 630(PB 171 935)	S-17
PB 156 636(PB 171 942)	S-15
PB 155 637	S-11
PB 155 638	S-11
PB 155 647	S-13
PB 155 655	S-27
PB 155 699	S-16
PB 155 796	S-20
PB 156 026	S-12
PB 156 459	S-39
PB 156 646	S-18
PB 156 667(PB 171 944)	S-39
PB 156 668(PB 171 943)	S-39
PB 156 703(PB 171 940)	S-19
PB 156 705(PB 171 952)	S-29
PB 156 707(PB 171 936)	S-37
PB 156 843(PB 171 938)	S-14
PB 156 844(PB 171 937)	S-15
PB 156 849(AD-258 753)	S-19
PB 156 882(PB 171 950)	S-7
PB 156 915(PB 171 941)	S-11
PB 157 023(AD-255 915)	S-20
PB 157 035(PB 171 951)	S-28
PB 157 081(AD-255 896)	S-8
PB 157 230	S-21
PB 157 238	S-21
PB 157 247	S-27
PB 157 251	S-14
PB 157 255	S-2
PB 157 264	S-20
PB 157 265	S-1
PB 157 269	S-26
PB 157 267	S-1
PB 157 270	S-9
PB 157 271	S-10
PB 157 272	S-9
PB 157 274	S-15
PB 157 275	S-41
PB 157 276	S-41
PB 157 277	S-41
PB 157 278	S-23
PB 157 279	S-8
PB 157 281	S-43
PB 157 289	S-16
PB 161 608	S-16
PB 161 612	S-37
PB 161 759-3	S-27
PB 171 262(AD-259 551)	S-21
PB 171 359	S-29
PB 171 539	S-38
PB 171 858(AD-257 357)	S-19
PB 171 863(AD-257 358)	S-19
PB 171 929	S-10
PB 171 930	S-11
PB 171 931	S-42
PB 171 932(AD-257 874)	S-10
PB 171 933	S-9
PB 171 934	S-10
PB 171 935	S-17
PB 171 936	S-37
PB 171 937	S-15
PB 171 938	S-14
PB 171 939	S-22
PB 171 940	S-19
PB 171 941	S-11
PB 171 942	S-15
PB 171 943	S-39
PB 171 944	S-39
PB 171 945	S-32
PB 171 946	S-30
PB 171 947	S-29
PB 171 948	S-22
PB 171 949	S-4
PB 171 950	S-7
PB 171 951	S-28
PB 171 952	S-29
PB 171 953	S-41
PB 171 954	S-20
Pesco-ER-3094	S-21
Philco R-111.1	S-15
PIB-263	S-15
PIBMRI-327-53	S-15
Proj. 9-89-02-000	S-10
PWAC-340	S-5
RADC-TR-55-76	S-14
RALRR-127	S-27
RIAL-61-1403	S-21
RM-2686-AEC	S-26
RWD-RL-190	S-35
SCR-420	S-31
SEL TR-1753-1	S-17
SEL TR-2106-2	S-17
SRI-2164	S-35
SRIA-36	S-35
TAMC Ref-58-31T	S-8
TED ADC AV-44016	S-14
TID-3563	S-29
TID-4000 (6th Ed.)	S-31
TID-7610	S-5
TID-12638	S-8
TID-12788	S-32
UCRL-5625(Rev.)	S-31
UCRL-6343	S-18
UCRL-6374	S-31
UCRL-6441	S-31
UCRL-6444	S-5
UCRL-6450	S-37
UCRL-6455-T	S-41
UCRL-9650	S-32
UCRL-9651	S-32
UCRL-9695	S-5
UCRL-9709	S-5
UCRL-9743	S-34
UMRI-2277-14-F	S-10
UMRI-2498	S-30
UMRI-2900-43-T	S-37
UMRI-2944-1-T	S-37
USNRDL-TR-349	S-32
USNRDL-TR-367	S-35
USNRDL-TR-379	S-25
USNRDL-TR-389	S-5
USNRDL-TR-445	S-39
WADC-TN-55-68	S-9
WADC-TN-55-507	S-27
WADC-TN-56-7	S-10
WADC-TN-59-188	S-38
WADC-TR-54-524, pt. 1	S-26
WADC-TR-56-8	S-1
WADC-TR-59-426	S-21
WADC-TR-59-443	S-32
WADC-TR-59-681	S-30
WADC-TR-59-762, pt. 3	S-29
WADC-TR-60-705	S-22
WADD TR-60-359	S-41
WADD TR-60-670, pt. 2	S-20
WADD TR-60-699, v. 1	S-19
WADD TR-60-699, v. 6	S-19
WADD TR-60-813	S-4
WAPD-234	S-30
WHOI Ref-52-88	S-8
Y-1356	S-33
Y-1358	S-33
YAEC-183	S-36

U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

Department Field Offices

ALBUQUERQUE, N. MEX., U.S. Courthouse.
ATLANTA 3, GA., 604 Volunteer Bldg.
BOSTON 10, MASS., Room 230, 80 Federal St.
BUFFALO 3, N.Y., 504 Federal Bldg.
CHARLESTON 4, S.C., Area 2, Sergeant Jasper Bldg., West End Broad St.
CHEYENNE, WYO., 207 Majestic Bldg.
CHICAGO 6, ILL., Room 1302, 226 W. Jackson Blvd.
CINCINNATI 2, OHIO, 809 Fifth Third Bank Bldg.
CLEVELAND 1, OHIO, Federal Reserve Bank Bldg.
DALLAS 1, TEX., Room 3–104 Merchandise Mart.
DENVER 2, COLO., 142 New Customhouse.
DETROIT 26, MICH., 438 Federal Bldg.
GREENSBORO, N.C., 407 U.S. Post Office Bldg.
HOUSTON 2, TEX., 610 Scanlan Bldg.
JACKSONVILLE 1, FLA., 425 Federal Bldg.
KANSAS CITY 6, MO., Room 2011, 911 Walnut St.
LOS ANGELES 15, CALIF., Room 450, 1031 S. Broadway.
MEMPHIS 3, TENN., 212 Falls Bldg.
MIAMI 32, FLA., 408 Ainsley Bldg.
MINNEAPOLIS 1, MINN., 304 Federal Bldg.
NEW ORLEANS 12, LA., 333 St. Charles Ave.
NEW YORK 1, N.Y., Empire State Bldg.
PHILADELPHIA 7, PA., Jefferson Bldg.
PHOENIX, ARIZ., 137 N. Second Ave.
PITTSBURGH 22, PA., 355 Fifth Ave.
PORTLAND 4, OREG., 217 Old U.S. Courthouse and P.O. Bldg.
RENO, NEV., 1479 Wells Ave.
RICHMOND 19, VA., 309 Parcel Post Bldg.
ST. LOUIS 1, MO., 910 New Federal Bldg.
SALT LAKE CITY 1, UTAH, 222 SW. Temple St.
SAN FRANCISCO 11, CALIF., Room 419 Customhouse.
SAVANNAH, GA., 235 U.S. Courthouse and P.O. Bldg.
SEATTLE 4, WASH., 809 Federal Office Bldg.

For local telephone listing, consult section devoted to U.S. Government

UNITED STATES
GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON 25, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300